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CHARTER FISHING PATRONS IN HAWAII: A STUDY OF THEIR DEMOGRAPHICS, MOTIVATIONS, EXPENDITURES AND FISHING VALUES

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CHARTER FISHING PATRONS IN HAWAII: A STUDY OF THEIR DEMOGRAPHICS, MOTIVATIONS, EXPENDITURES AND FISHING VALUES

FINAL REPORT

by

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PREFACE

This report concludes a multiyear study of charter fishing conducted by Dr. Karl C. Samples of the University of Hawaii. The study was a joint undertaking of the Hawaii Institute of Tropical Agriculture and Human Resources (University of Hawaii) and the Southwest Fisheries Center Honolulu Laboratory, National Marine Fisheries Service, NOAA, under NOAA contract (83-ABC-00144).

The objectives of this study were to examine the motivations of people going charter boat fishing in Hawaii, to relate these characteristics to features of the charter boat fleet, and to estimate the economic demand in market and nonmarket demand for charter boat fishing in Hawaii. The University of Hawaii fielded a survey of charter boat patrons using Kewalo Basin in Honolulu during 1984, and this report presents Dr. Samples' analysis of that survey.

An earlier study investigated the activities of charter boats throughout Hawaii from the charter boat operator's point of view, and results from the study were released as a Southwest Fisheries Center Administrative Report ("A description and economic appraisal of charter boat fishing in Hawaii," April 1984, H-84-6C).

This report was prepared under contract. Thus, the statements, findings, conclusions, and recommendations are those of Dr. Samples and his associates, and do not necessarily reflect the views of the National Marine Fisheries Service.

Samuel G. Pooley
Industry Economist

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EXECUTIVE SUMMARY

The purpose of this study is to develop a complete and accurate description of charter patron demographics, motivations, fishing values and trip taking behavior. Dockside interviews were conducted with 732 charter patrons disembarking from boats at Kewalo Basin, located on the island of Oahu. Additional detailed expenditure, attitudinal and behavioral data was obtained from 457 patrons who returned questionnaires by mail. Efforts were made to collect data that could be compared directly with survey results reported for Kailua-Kona charter patrons, and for patrons in other areas of the United States. None of the patrons interviewed during the study were engaged in tournament fishing.

The survey showed that 83% of patrons were visitors. A clear majority of visitors were from Canada. Most patrons were high income males in the 25-44 year age group. Over half of the sampled group reported annual household incomes in excess of $40,000. Compared to charter patrons in other states, interviewed patrons go charter fishing relatively infrequently. The overall average number of charter trips taken in and outside of Hawaii averaged less than 1 per year. Residents took relatively more charter fishing trips in Hawaii while visitors took more charter trips elsewhere. Charter fishing was not a particularly important factor influencing the typical visitor's decision to come to Hawaii.

Patrons were motivated to go charter fishing by the desire to experience a fun recreational activity. The desire to catch fish was a less important motive. Residents placed relatively more importance on the socializing aspects of charter fishing. Patrons were generally satisfied with their fishing experience, even if no fish were caught.

Patrons, on average, caught less than one fish per trip. Boats, on average, landed 3 fish per trip. The most common fish caught were aku, ahi, and mahimahi. Shark and barracuda were most infrequently caught. Only 1 out of every 10 anglers caught a billfish, which was the most desired fish to catch. Patrons generally held aku and barracuda in low esteem.

Patrons spent $129 and $104, on average, for a full and half-day of charter fishing, respectively. Visitors spent 43% more on average than residents. It was estimated that in 1984 patrons spent $6 million in total for charter fees alone. This compares very closely with a separate estimate of total charter fees collected by Hawaii's charter fishing fleet (Samples et al., 1984). A total of $39.4 million was spent to cover costs that were indirectly related to charter fishing as a vacation or leisure activity.

Annual consumer surplus value of charter fishing was estimated to be $4.2 million, or $57 per trip. The total value of charter

fishing to patrons in 1984 (including charter fishing fee payments) was therefore approximately $10 million. Using hedonic price analysis, it was determined that prices charged for full-day share trips are sensitive to marlin catch rates and vessel service features. Prices were not found to be sensitive to mahimahi catch rates. Contingent ranking results showed that patrons were willing to pay an additional $65 in charter fees if the probability of landing a 250 pound blue marlin on a given trip increased by 65% above current Kewalo Basin average catch rates. Patrons were willing only to pay $4 more in charter fees for substantial increases in the probability of landing a mahimahi. Taken together the results suggest that changes in marlin catch rates will not significantly affect demand for charter boat services because: 1) historical catch rates do not seem to influence patrons' aggregate trip taking behavior; 2) information about catch rates is not generally available to prospective patrons, and 3) catching fish is not the sole purpose of taking a charter boat trip. Nevertheless, patron satisfaction is closely tied to the chance of being able to catch a marlin, sailfish or some other type of billfish.

INTRODUCTION

It is becoming increasingly apparent that sportfishing has considerable economic and biological importance in Hawaii. Commercial sportfishing, involving the temporary hire of vessels and crews for purposes of offshore fishing, is perhaps best understood in this regard. According to recent estimates 119 charter boats operated on a full and part-time basis during 1982 and generated sales of just over $8 million (Samples et al. 1984). In addition to this revenue impact, the charter fleet landed an estimated 2.2 million pounds of fish which represented 15% of reported commercial fish landings in Hawaii. Pacific blue marlin (Makaira nigricans) landings constituted roughly a third of total charter boat catch. Biological and economic impacts attributed to the commercial sportfishing industry are tied directly to a constant demand by Hawaii residents and visitors for the services of charter fishing boats. Samples et al. (1984) estimate that 73,780 charter trips were demanded in 1982, most by non-repeat customers. Fishermen from all over the world, motivated by the opportunity for fun and relaxation, and the possibility of fighting a large gamefish, pay $70 on average to experience a day of offshore sportfishing.

To date, little information has been assembled about Hawaii charter boat customers in terms of their preferences, expenditures and motivations. Although Samples et al. (1984) constructed a profile of the charter boat fleet, information collected on customers was second hand, based on the perceptions of boat owners and skippers. A 1977 study of fishermen in Kailua-Kona, Hawaii provided a preliminary statistical profile of the charter patron population (NMFS, 1983a). Using personal interviews of residents and visitors, information was collected on patron demographics, motivations and expenditures. Also potentially useful in understanding Hawaii's charter fishing market are other studies of charter patron characteristics in Wisconsin (Ditton et al., 1975), Texas (Ditton et al., 1978), South Carolina (Liao and Cupka, 1979) and North Carolina (Abbas, 1978) . However, no attempts have heretofore been made to compare and contrast the findings of these studies with the situation in Hawaii.

The goal of this study is to develop a complete and accurate description of charter patron demographics, motivations, fishing values and trip taking behavior. Specific research objectives are fourfold: (1) to develop socioeconomic profiles of charter boat customers; (2) to estimate the direct and indirect economic impacts associated with charter fishermen's expenditures; (3) to measure the value of charter fishing to patrons, and (4) to determine the sensitivity of this value to changes in catch rates, catch composition and vessel characteristics.

This report summarizes research procedures and major findings. It is organized in the following manner. Data collection procedures are discussed in the ensuing section. A statistical profile of charter patrons is provided in the third section including information on demographics, trip taking behavior and motivations. Patron expenditures and associated economic impacts are subsequently described. Various estimates of the social value of charter fishing are presented in the seventh section, followed by an analysis of the sensitivity of value to changes in prevailing catch rates, catch composition and vessel characteristics. Concluding remarks focus on three principal topics. First, data and analytical limitations of the study are spelled out. After this disclosure, the implications of research findings for fisheries management are addressed, with particular reference to billfish management. Finally, the implications of research findings for expanding consumer demand for charter boat services in Hawaii are evaluated. This discussion will probably be of greatest interest to industry members.

METHODS

During 1983, approximately 74,000 passenger trips were provided by Hawaii's charter fishing fleet(Samples et al., 1984). The large number of charter fishing customers necessitated drawing a sample in order to achieve the research objectives stated above. It was decided to select the sample entirely from patrons disembarking from charter fishing boats at Kewalo Basin, a boat harbor located in Honolulu on the island of Oahu. Samples et al. (1984) estimate that Oahu is the home base for 27% of Hawaii's charter fishing boats. The majority of Oahu boats operate out of Kewalo Basin. Concentration on Kewalo Basin as the target sample area permitted a larger total sample to be taken than would be otherwise possible by conducting surveys at various ports around the state. Recognition was given to the fact that limiting fielding effort to Kewalo Basin would call into question whether the sample represented the entire patron population, especially patrons taking charter fishing trips on one of the other Hawaiian Islands. Nevertheless, it was anticipated that possible population differences could be detected, at least for patrons on the island of Hawaii, by comparing Kewalo Basin sample characteristics results with patron characteristics reported in the 1976 study of charter patrons in Kailua-Kona, Hawaii (NMFS, 1983a).

The desired sample size was set at 730 person/trips or approximately 4% of the 16,700 trips taken on Oahu in 1983. This large sample size allowed two separate questionnaire versions to be fielded with an expected error of not more than 5% in parameter estimates.

2.1 Pilot Surveys

An initial pilot survey of charter fishing patrons was conducted at Kewalo Basin from July 22 to August 2, 1983. The principal objective of the survey was to examine the practicality of conducting on-site personal interviews. An additional objective was to identify factors that influence patrons' enjoyment of a typical charter fishing trip.

Patrons of twelve different charter fishing boats were interviewed on the dock after the boats returned from fishing. Nearly all of the boats returned each day within the same two hour period (1400-1600 hours). A total of 29 patrons were interviewed by a single interviewer over the course of seven sampling days. It was necessary to keep the survey instrument brief since patrons were busy photographing their catch, arranging transportation back to their hotels and, in some cases, recuperating from a somewhat arduous recreational experience. Initial survey experience suggested that a possible source of sampling bias in on-site interviews was that patrons who caught fish were relatively easy to intercept since they would remain on

the dock waiting for their catch to be offloaded. Patrons who did not catch fish tended to depart from the docking area almost immediately. It was concluded that this source of sampling bias could be eliminated by distributing a questionnaire that patrons could return by mail.

A second survey pretest was conducted during October 20 to November 22, 1983. The primary purpose of the second survey was to determine the response rates and quality of responses for various questionnaire instruments. At the same time, a survey technique that involved a combination of mail questionnaires and personal interviews was evaluated. Charter patrons were intercepted as they disembarked and asked a short series of questions pertaining to point of origin, fish catch, price per trip and importance of charter fishing. After completing short personal interviews (taking less than 5 minutes), patrons were given a more detailed questionnaire to complete and return by mail at a later date. A self-addressed stamped envelope was provided. Three mail questionnaire versions were experimented with: 1) an expenditure questionnaire directed at out-of-state visitors; 2) an expenditure questionnaire directed at Hawaii residents; and 3) a questionnaire aimed at measuring fishing values.

Response to the personal interview portion of the survey was very good, and no general refusals were observed. However, the return rates for the mail-in portion of the survey were less encouraging. Out of 29 questionnaires distributed to patrons, only 8 (27.5%) were returned. The response rate was highest for the visitor expenditure questionnaire (50%) and lowest for the resident expenditure questionnaire (0%).

A convenient feature of the two part survey method was that response rates for the mail-in portion could be analyzed for various types of individuals. The pilot survey revealed that a significantly higher response rate existed for those patrons who caught fish during the intercepted trip. Based on the low overall response rate, it was determined that patrons who did not catch fish were not sufficiently motivated to fill out a lengthy questionnaire. For this reason, 500 fishing hats and reef fish posters were purchased to distribute as free gifts to all patrons who responded to the survey. This tactic subsequently proved to be very successful.

2.2 Final Survey Fielding

Fielding efforts were exclusively concentrated on patrons disembarking from charter fishing boats at Kewalo Basin. A team of five trained interviewers from the University of Hawaii randomly intercepted English-speaking patrons. Interviewers were immediately abandoned upon learning that a selected patron was not conversant in English. A prearranged interview schedule was used that included every day of the week, including weekends. Nearly all the interviews(98%) were conducted between 1400 and

1600 hours. Attempts to intercept patrons of half-day charters were abandoned early in the fielding efforts due to the relative infrequency of half-day charters taken out of Kewalo Basin. With the exception of a single boat, all Kewalo Basin charter boat skippers and owners welcomed attempts to interview patrons from their boats.

The survey process incorporated the two part technique described above in the "Pilot Surveys" section. The first part was a 5-minute personal interview conducted at Kewalo Basin. The primary purpose of the dockside interview was to collect data on interviewees concerning their residency status, fish catch, the importance they placed on charter fishing and the price they paid for the charter trip. A secondary purpose was to inform interviewees about the objectives of the research and motivate them to cooperate in the mail-in part of the survey. The dockside interview form is reproduced in Appendix A. The second part consisted of a longer questionnaire, either the expenditure or valuation version, that was handed to interviewees upon completion of the dockside survey. Instructions were given to return the questionnaire by mail using a stamped, addressed envelope that interviewers provided. A free gift (hat or poster) was promised to interviewees if they returned the mail-in portion of the survey. All mail-in questionnaire versions are reproduced in Appendix A.

Survey fielding began on March 15, 1984 and continued until August 31, 1984. During this time period, 732 dockside interviews were successfully conducted. The distribution of interviews through time is given in Figure 2.1. Approximately 5% of all attempted interviews had to be curtailed prematurely either due to language barriers, or respondent refusal to cooperate. Patrons disembarking from 24 different charter boats were included in the study. No more that 12% of the total sample came from any single boat. Frequently, two or more patrons were intercepted as they disembarked from the same boat. Before being interviewed, however, it was first determined whether the patrons were in the same travel party (i.e., if they had shared charter fishing expenses). Cost sharing was generally limited to families or groups of business associates. At no time was more than one person from a travel party interviewed.

Response to the mail-in portions yielded 457 usable questionnaires (208 for the expenditure survey, 249 for the valuation survey). The overall response rate to the mail-in portion was 62.4% (457/732). Statistical contingency table tests were conducted to detect whether response to the mail-in portion of the survey was associated with fishing success on the intercepted fishing trip, residency status, or relative importance of charter fishing as a vacation or leisure activity. Statistical results reported in Table 2.1 support the belief that repondents and non-respondents to the mail-in portion of the survey share similar population characteristics. Assuming this is the case, non-response bias in the mail-in portion of the survey is not a significant concern.

Figure 2.1 1984 Sampling Time Frame By Month

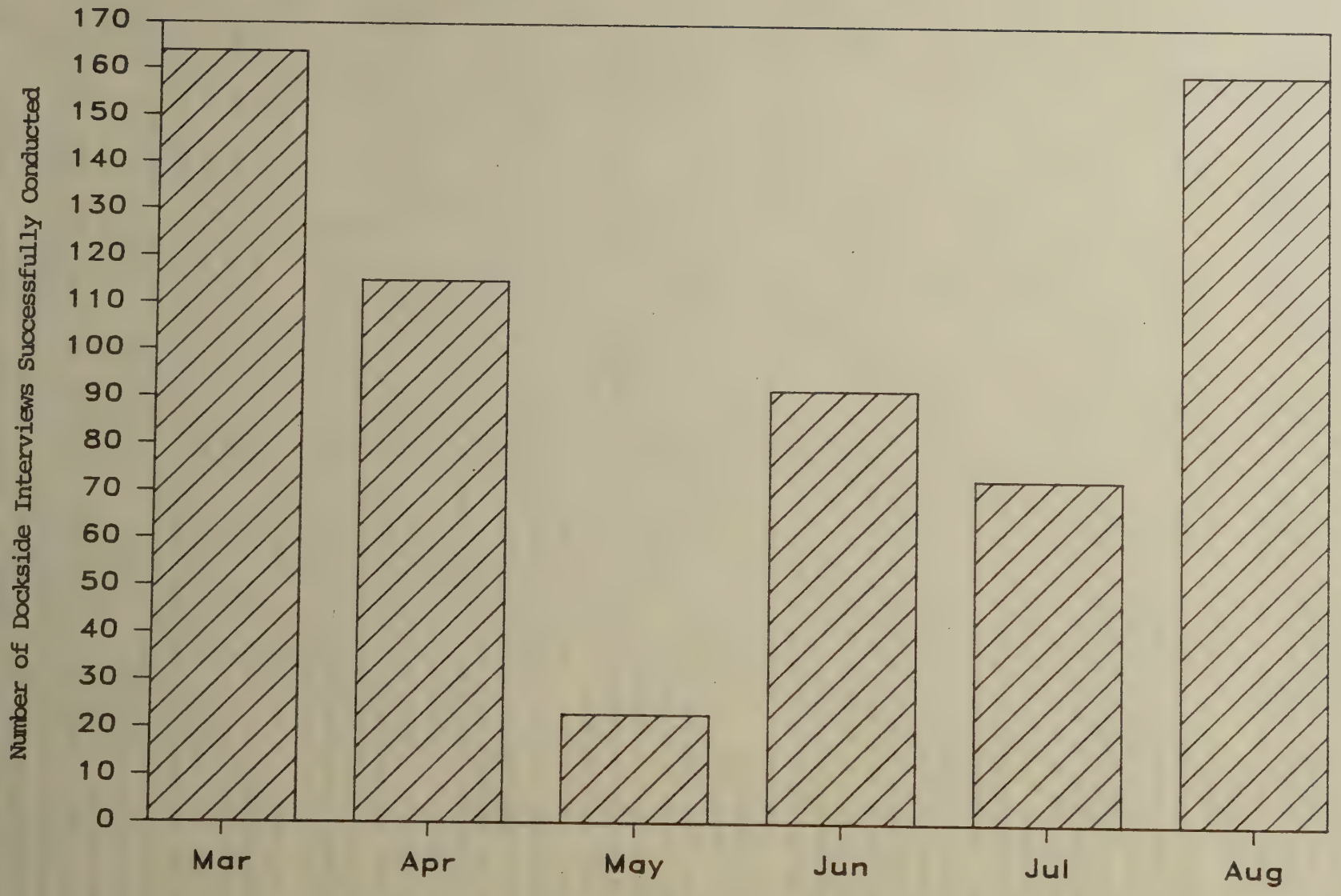


Table 2.1 Statistical Tests of Association Between Mail-In Survey Response and Patron Characteristics

Association Between Survey Response And:	Calculated Chi-Square Statistic (a)
Residency (b)	2.98
Importance of Charter Fishing as a Vacation or Leisure Activity (c)	0.23
Respondent Caught a Fish on Intercepted Trip (d)	0.05
Others on Boat Caught Fish on Intercepted Trip (e)	3.61

Notes:

(a) Respondents (N = 457); non-respondents (N = 275)

(b) Class levels: mainland U.S., Hawaii, foreign

(c) Class Levels: not important, moderately important, very important

(d) Class levels: yes, no

(e) Class levels: yes, no

PATRON CHARACTERISTICS

3.1 Demographics

The vast majority (83%) of charter patrons interviewed during the survey period were visitors (Table 3.1). This proportion is consistent with Samples et al. (1984) who reported that non-residents take 75% or more of charter fishing trips provided by Oahu-based boats. The large proportion of out-of-state patrons in Hawaii contrasts with charter patron populations in other states. In South Carolina, about half of the charter customers are from other states (Liao and Cupka, 1979); in Wisconsin about a third are out-of-state visitors (Ditton et al., 1975); and in Texas only 2 percent of the patrons are non-residents (Ditton et al., 1978). Nearly three quarters of the charter customers in Hawaii were from the U.S. mainland where about a half reside in coastal states. Patrons from foreign countries comprised roughly a fifth of the sample. This percentage, however, is probably not indicative of the proportionality of non-U.S. citizens in the total charter patron population because the sample was drawn only from English-speaking patrons. Japanese speaking patrons, for example, were routinely encountered departing from Kewalo Basin charter boats but were not interviewed. Records were not kept on the proportion of non-English speaking individuals encountered by dockside interviewers. Of those interviewed with foreign residencies, 91% were Canadian citizens. In fact, Canadians comprised a fifth of the total dockside sample. Given that the sample was randomly selected, this finding suggests that Canadians are represented in the charter population far in excess of their proportionality in the total Hawaii visitor population (reported to be 7% in 1982 (DPED, 1983a)).

Information on charter patrons' ages came from two sources. Interviewees (N=457) reported their own age on the mail-in portion of the survey. Information on the ages of family members who accompanied interviewees on intercepted charter trips was obtained during dockside interviews. Interviewees ranged in age from 14 to 76 years (Table 3.2). Average and median ages were 37 and 26, respectively. The median age class for interviewees and family members combined was 25 to 44 years. Predominance of this age group has also been observed for charter clientele in Wisconsin (Ditton et al., 1975) and Texas (Ditton et al., 1978).

A clear majority (86%) of interviewees were male. This was expected given the tendency for interviewees to be heads of households. Family members were found to be more nearly equally divided between the sexes with 59% male and 41% female. Overall, the proportion of males was 77%.

Charter patrons were found to have more education on average than the typical U.S. citizen. Just under three-quarters of the survey group had completed high school and 40% reportedly had

Table 3.1 Residency of Patrons

Residency		Percent (N=763)
Hawaii		17%
U.S. Mainland		61
Pacific Coast	11%	
Gulf Coast	7	
Atlantic Coast	10	
Other	33	
Foreign		22
Canada	20	
Other	2	
TOTAL		100%

Table 3.2 Ages of Patrons

Age (Years)	Respondents (N=457)	Other Members in Travel Party (N=306)	Respondents Plus Other Travel Party Members (N=763)
Less than 15	1%	14%	7%
15 - 24	13	24	17
25 - 44	57	40	50
45 - 64	23	19	21
65 or more	2	2	2
No Response	4	1	3
TOTAL	100%	100%	100%

earned college degrees. This finding is consistent with the observation that many patrons hold professional or managerial positions (Table 3.3). Doctors, technicians, sales representatives and businessmen were routinely intercepted.

Survey results suggest that the typical charter patron has a household income higher than the average U.S. citizen. Over half (52%) of the sample group reported annual family incomes in excess of $40,000. This is closely comparable with income levels for mainland visitors to Hawaii in general (DPED, 1983b). By comparison in 1982, only 16% of U.S. residents had household incomes greater than $35,000 (USBC, 1983). Only 11% of intercepted patrons reported annual family incomes less than $20,000 (Table 3.4). Military personnel and dependents comprised the bulk of this lower income group. Relatively high incomes for Oahu charter patrons parallels survey findings by NMFS (1983a) indicating that 62% of charter patrons in Kailua-Kona, Hawaii had incomes exceeding $60,000 (expressed in 1983 dollars). These results also coincide with patron surveys in Texas (Ditton et al., 1978), Wisconsin (Ditton et al., 1975) and South Carolina (Liao and Cupka, 1979) which uniformly characterize charter customers as white-collar workers with high incomes.

3.2 Charter Fishing Activity

In the mail-in portion of the survey, charter patrons were queried about the number of charter fishing trips they had taken in Hawaii and outside of Hawaii during the last five years (including the intercepted trip). Observations for reported number of trips were lognormally distributed, with the bulk of the distribution at the lower end of the trip range. This was true for total trips, trips in Hawaii and trips taken outside of Hawaii (Table 3.5).

Total trips taken in and outside of Hawaii during the previous five years ranged from 1 to 51. The overall mean was 4.3 trips, or an average of 0.8 trips per year. Included in this figure was an average of 1.6 trips taken in Hawaii (range 1 to 25) and 2.7 trips taken outside of Hawaii (range 0 to 50 trips). Out of a sample of 248 patrons, 39% indicated that the intercepted trip was the only charter fishing excursion trip they had taken during the past five years. Half of the sample group took 5 trips or less in total. Only 10% of the group took 10 or more trips in total, or more than 2 trips on average per annum. Overall the frequency of trips taken by respondents was considerably lower than the number of trips taken by Texas Gulf charter boat anglers who averaged 3.2 trips per year (Ditton et al., 1978).

Statistical tests were conducted to test hypotheses that residents and visitors take the same number of charter fishing trips in total, in Hawaii and outside of Hawaii (results in Table 3.6). The mean number of total trips for residents and visitors was not significantly different at the 0.05 level. However, residents took significantly more trips in Hawaii compared to

Table 3.3 Occupations of Patrons

Occupation	Percent (N=457)
Self-employed Businessperson	26%
Professional	24
Skilled Worker	15
Salesperson	8
Military	7
Others	9
Retired	9
No Response	2
TOTAL	100%

Table 3.4 Reported Income Levels of Patrons

Family Income Before Taxes	Percent (N=457)
$ 4,000 - $ 7,999	1%
8,000 - 11,999	2
12,000 - 15,999	2
16,000 - 19,999	6
20,000 - 23,999	5
24,000 - 27,999	6
28,000 - 31,999	9
32,000 - 35,999	7
36,000 - 39,999	6
40,000 - 43,999	7
44,000 - 47,999	6
Over $48,000	36
No Response	6
TOTAL	99%(a)

Note:

(a) Deviation from 100% due to rounding error

Table 3.5 Frequency of Charter Fishing Trips Taken by Patrons Over Past Five Years

Number of Trips Taken	In Hawaii (N=249)	Outside of Hawaii (N=249)	Total (N=249)
0	0%	49%	0%
1	82	15	39
2	10	9	17
3	2	4	9
4	2	4	5
5	1	6	6
6	1	4	6
7	1	1	4
8	(a)	2	2
9	0	0	2
10	0	2	(a)
11-20	1	2	6
Over 20	(a)	2	4
TOTAL	100%	100%	100%

Note:

(a) Less than 1%

Table 3.6 Statistical Comparison Between Average Number of Charter Fishing Trips Taken Over Previous Five Years by Resident and Visitor Patrons

Location of Trips	Average Number Taken By(a): Residents (N=40)	Visitors (N=208)	Calculated t-statistic
Total Trips	4.62 (7.08)	4.16 (5.64)	1.07
In Hawaii	3.52 (5.01)	1.21 (0.75)	6.34 *
Outside of Hawaii	1.10 (4.93)	2.95 (5.54)	1.97 *

Notes:

(a) Standard errors in parentheses

(*) Significant at the 0.05 level

visitors. Visitors, on the other hand, took significantly more trips outside of Hawaii.

For residents, charter trips taken in Hawaii represented on average 74% of the total charter trips taken during the past 5 years. The number of Hawaii charter trips reportedly taken by residents ranged from 1 to 25. Most (85%) residents took 5 or less trips in Hawaii during the past 5 years. The number of trips taken outside of Hawaii by residents ranged from 0 to 30. Out of the subsample of 40 residents, 80% reported that they had taken no charter fishing trips outside of Hawaii during the past 5 years.

In contrast with residents, visitors took the majority (71%) of their charter trips outside of Hawaii. The number of charter trips taken by visitors outside of Hawaii ranged between 1 to 50. Most (80%) visitors took 5 trips or less outside of Hawaii. The number of charter trips taken in Hawaii by visitors during the last five years ranged between 1 and 7. For 87% of visitors, the intercepted trip was the only charter trip, only 1 trip had been taken in Hawaii.

Four statistical contingency table tests were conducted to determine if any association existed between total number of trips taken and respondent income, occupation, retirement status and importance attached to charter fishing as a vacation or leisure activity. In all cases, the hypothesis that no association existed could not be rejected at the 0.05 significance level.

3.3 Importance of Charter Fishing and Fishing Motives

During dockside interviews, all respondents were asked to rate the importance of charter fishing in Hawaii as a vacation or leisure activity. Respondents were provided fixed response choices of "not important", "moderately important", and "very important." Out of 727 patrons interviewed, 8% claimed that charter fishing was not important, nearly half (48%) indicated it was moderately important, and the remainder (43%) claimed it was very important. Residents and visitors rated the relative importance of charter fishing about equally.

Visitors were asked whether opportunities for charter fishing had influenced their decision to visit Hawaii. Virtually all of the visitor patrons (99%) reported that they still would have come to Hawaii if charter fishing was not available. In a related question, visitors were asked to assign a percentage of importance to charter fishing as a motivating factor for coming to Hawaii. Out of 173 respondents, 32% indicated that charter fishing had no influence on their decision to visit Hawaii (Table 3.7). Just over half of the group assigned a 10% or less percentage importance. Less than 10% of the responding group assigned a percentage importance of 50% or higher. The overall mean percentage importance was 20%. In comparison, fishing was

Table 3.7 Relative Importance of Charter Fishing to Patrons in Their Decision to Visit Hawaii

Percent Importance	Percent (N=173)
0%	32%
1-10	22
11-20	11
21-30	8
31-40	8
41-50	9
51-60	2
61-70	1
71-80	3
81-90	1
91-100	1
No Response	2
TOTAL	100%

$\overline{X}$ = 20%

stated as the major reason for their vacation trip by 73% of the patrons in Wisconsin (Ditton et al., 1975), 60% of the patrons in South Carolina (Liao and Cupka, 1979) and 70% of the patrons in North Carolina (Abbas, 1978).

Patrons' motives for taking a charter fishing trip were investigated by providing respondents with a list of 15 possible motivating factors. Respondents were asked to rank each in terms of importance on a three point scale: "very important", "moderately important", and "not at all important". The motives, reproduced verbatim in Table 3.8, were more or less randomly organized in the questionnaire. However, each motive could be classified into one of three general groups; those related to the act of catching fish, those that related to the relaxation aspects of fishing, and those related to socializing with friends, relatives or business associates.

Respondents assigned the most importance to the motive "to have fun" (Table 3.8). The second most important factor was "to experience a fishing challenge". The only factor rated very important by a majority of respondents was "to fight a fish". The least important motivating factors were status-related catch motives such as "to demonstrate fishing skills to others", and "to catch a fish to be mounted". In general, relaxation motives were relatively more important than catch motives, which in turn were more important than social motives. Seventy-six of the patrons surveyed probably or definitely agree that even if they don't catch any fish, they still enjoy the charter fishing experience. Parallel results reported by Ditton et al. (1978) suggest that the majority of Texas Gulf charter patrons are motivated more by the opportunity to relax than by the prospect of catching fish. Only twenty-nine percent of patrons in the Texas survey would not fish if the probability of landing a fish was very low. Similarly, Abbas (1978) noted that many of the charter fishing parties in North Carolina are family groups who enjoy the boat ride as much or more than the fishing.

Statistical analyses were conducted to test for associations between residency status and the importance of certain motives for taking a charter fishing trip. For half of the motives, statistically significant difference in importance ratings were detected between residents and visitors (Table 3.9). Residents generally assigned less importance to catch related motives compared to visitors. Perhaps this is because residents have more opportunities to catch fish in Hawaii. A notable exception to this pattern was the motive "to be able to eat fish", which was rated as being important by a majority of residents. According to Hudgins (1980), Hawaii residents eat more fish on average than do U.S. mainland residents. In addition, it is more convenient for residents to keep any fish caught. Residents also attached relatively higher importance to the social related motives compared to visitors. Residents are probably more likely to have family, friends and business associates close at hand to be able to share charter fishing experiences. In this regard,

Table 3.8 Patron Motivations for Taking a Charter Fishing Trip in Hawaii

Motivating Factor	Importance Rating (N=248) Very Important	Moderately Important	Not at all Important	Total
CATCH RELATED MOTIVES				
To fight a fish	53%	35%	12%	100%
To experience a fishing challenge	62	30	8	100
To be able to eat fish	8	23	69	100
To develop fishing skills	19	37	43	99(a)
To demonstrate fishing skills to others	1	13	86	100
To catch a fish to be mounted	13	25	61	99(a)
RELAXATION RELATED MOTIVES				
To have fun	74	22	4	100
To escape the daily routine and relieve tension	24	41	35	100
To seek adventure	44	41	14	99(a)
To learn about nature	14	42	44	100
To be on the ocean	29	47	24	100
SOCIAL RELATED MOTIVES				
To be with other people with similar interests	15	40	45	100
To establish/maintain business contacts	2	6	92	100
To share a recreational experience with friends and family	48	35	16	99(a)

Note:

(a) Deviation from 100% due to rounding error

Table 3.9 Statistical Tests of Relationship Between Residency Status and Patron Motivations for Taking a Charter Fishing Trip in Hawaii

Motivating Factor	Importance Rating(a) Residents (N=40) VI	MI	NI	Visitors (N=207) VI	MI	NI	Calculated Chi-Square Statistic
CATCH RELATED MOTIVES							
To fight a fish	28%	55%	17%	59%	30%	11%	13.38 *
To experience a fishing challenge	38	55	8	66	26	8	14.15 *
To be able to eat fish	20	20	60	5	24	71	10.18 *
To develop fishing skills	10	50	40	21	35	44	4.28
To demonstrate fishing skills to others	0	15	85	1	13	86	0.74
To catch a fish to be mounted	0	8	92	15	29	56	19.70 *
RELAXATION RELATED MOTIVES							
To have fun	83	15	2	73	23	3	1.48
To escape the daily routine and relieve tension	35	48	17	22	40	38	7.02 *
To seek adventure	35	50	15	46	40	14	1.71
To learn about nature	20	40	40	13	43	44	1.35
To be on the ocean	33	43	25	29	47	24	0.33
SOCIAL RELATED MOTIVES							
To be with other people with similar interests	28	52	20	13	38	49	12.84 *
To establish/maintain business contacts	0	13	87	2	4	94	4.84
To share a recreational experience with friends and family	63	33	4	46	35	19	5.85 *

Notes:

(a) VI=Very Important; MI=Moderately Important; NI=Not at all Important

(*) Significant at the 0.05 level

survey data showed that respondents were more often accompanied by family members compared to visitors.

3.4 Patron Decision Information

3.4.1 Charter Fishing Information

Patrons were asked to indicate what source(s) of information prompted them to go charter fishing in Hawaii (Table 3.10). Contingency table analyses were performed to examine the relationship between the sources of information which induced patrons to take a charter trip and patrons' residency status (Table 3.11). The source of information most frequently cited by visitors to Hawaii was a personal visit to the boat harbor. These results were unexpected in view of the fact that the expenditure survey indicated that 73% of out-of-state patrons planned to go charter fishing before their arrival in Hawaii. Local residents were most often encouraged to take a charter trip by a previous fishing experience in Hawaii. The suggestion of friends provided a major impetus to go charter fishing to both residents and visitors. The influence of advertisements in magazines or newspapers was relatively small, particularly for residents. These results are in general agreement with data collected from charter patrons in South Carolina by Liao and Cupka (1979). Fifty percent of the patrons were motivated to go charter fishing in South Carolina by past fishing trips; 23% by friends and relatives; and only 3% by advertisements.

Survey participants were also asked to rate the importance of various sources of information in their selection of a particular charter boat (Table 3.12). The results of contingency table analyses designed to test the association between sources of information used and patrons' residency status are presented in Table 3.13. The most popular method of obtaining information about individual boats is through a personal visit to the boat docking area at Kewalo Basin. Sixty-four percent of the respondents rated this method as moderately or very important. This source is of particular importance to visitors even though Kewalo Basin is located about two miles from the hotel district of Waikiki. A visit to the boat harbor prior to booking a charter trip allows customers to inspect boats and converse with boat crews. When the boats return to the harbor after a day's fishing, customers can observe the catch of each vessel as it is offloaded and displayed on the dock. The day's catch can also be determined by noting the "fish flags" flown by each vessel.

The second most popular source of information is by word-of-mouth whereby customers collect information by asking friends and relatives for recommendations of suitable boats. Fifty-one percent of the patrons rated this source as moderately or very important. Recommendations were rated moderately or very important more often by residents (89%) than by visitors (55%). In Wisconsin, Ditton et al. (1975) found word-of-mouth to be the most commonly used method of choosing a particular captain, with

Table 3.10 Sources of Information Prompting Patrons to Go Charter Fishing

Source	Percent (N=249)
Magazine or Newspaper Ads	22%
Hotel Tour Desk	11
Television Program or Movie	14
Tour Package Plan	2
Personal Visit to Boat Docking Area	32
Suggestion of Friends	38
Previous Experience Fishing in Hawaii	17
Other	22
No Response	3

Table 3.11 Statistical Tests of Relationship Between Residency Status and Sources of Information Prompting Patrons to Go Charter Fishing

Source	Residents (N=39)	Visitors (N=203)	Calculated Chi-Square Statistic
Magazine or Newspaper Ads	8%	26%	5.98 *
Hotel Tour Desk	0	13	5.84 *
Television Program or Movie	10	16	0.78
Tour Package Plan	0	2	0.78
Personal Visit to Boat Docking Area	13	37	8.90 *
Suggestion of Friends	56	35	6.04 *
Previous Experience Fishing in Hawaii	46	12	25.64 *
Other	18	24	0.70

Note:

(*) Significant at the 0.05 level

Table 3.12 Importance of Various Information Sources Used by Patrons to Select a Particular Boat

Source	Importance Rating (N=249) Not Important	Moderately Important	Very Important	No Response	TOTAL
Recommendation of Friends	39%	25%	34%	2%	100%
Personal Visit to Boat Harbor	34	29	35	2	100
Hotel Tour Desk	71	15	12	2	100
Magazine or Newspaper Ad	63	28	6	2	99(a)
Tour Package Plan	85	11	1	2	99(a)
Yellow Pages	74	18	5	2	99(a)
Previous Fishing Experience with Captain/Boat	50	13	35	2	100

Note:

(a) Deviation from 100% due to rounding error

Table 3.13 Statistical Tests of Relationship Between Residency Status and Importance of Various Information Sources Used by Patrons to Select a Particular Boat

Source	Residents (N=39)			Visitors (N=203)			
	Not Important	Moderately Important	Very Important	Not Important	Moderately Important	Very Important	Calculated Chi-Square Statistic
Recommendation of Friends	10%	28%	61%	45%	25%	30%	19.59 *
Personal Visit to Boat Harbor	49	31	20	32	29	38	5.58
Hotel Tour Desk	90	10	0	70	16	14	8.05 *
Magazine or Newspaper Ad	77	23	0	62	30	8	4.61
Tour Package Plan	87	13	0	87	11	1	0.64
Yellow Pages	69	20	10	77	18	4	2.45
Previous Fishing Experience with Captain/Boat	18	13	69	57	13	30	24.03 *

Note:

(*) Significant at the 0.05 level

with 51% of the Wisconsin patrons relying on this information source.

Customers may also select a specific boat as a result of having had a favorable previous experience fishing with that boat or crew. Although less than half of the respondents indicated this information source to be significant, 73% of those that did rated it as very important. As with the recommendations of friends, previous experience was rated moderately or very important more frequently by residents (82%) than by visitors (43%).

The other sources of information examined were of markedly less importance in the boat selection process than those discussed above. Twelve percent or less of the respondents rated these sources as very important. The lack of importance does not necessarily reflect the availability of these sources to potential charter customers. Approximately 20 of the 25 charter boats docked at Kewalo Basin are listed in the Oahu yellow pages. Yet less than 25% of the respondents reported this source of information to be of any importance. At least two locally published newspapers, "Hawaii Fishing Charter Guide" and "Hawaii Fishing News," carry advertisements for charter boat firms and are available both in local newsstands and by subscription. The percentage of respondents rating this source as very important was zero for residents and only 8% for visitors. Although the overall importance of hotel tour desks was low, 14% of visitors considered this source to be very important. Tour package plans were indicated to be of low importance by both visitors and residents. Advertising, booking agencies and yellow pages were also reported to be of minor importance in attracting charter patrons in Wisconsin to specific captains (Ditton et al., 1975).

A personal visit to the boat harbor and hotel tour desks were used as the sole sources of information by 24% and 16% of the respondents who used those sources, respectively. The other sources of information tended to be used in combination with at least one other source.

From the viewpoint of the patron, the importance of the different sources of information lies in the variation in the quantity and quality of information conveyed about attributes which differentiate charter boats. Information on trip price, boat specifications and vessel comfort features can readily be obtained prior to booking a trip from advertisements, over the telephone or through a personal visit to the boat harbor. On the other hand, the service and friendliness of the boat personnel in a fishing situation can be fully evaluated only after a trip has been taken. Advertised claims for these attributes are of limited usefullness since they can not be verified before a trip is booked. Reliable information on these attributes is available only if a customer has had a previous experience fishing with a particular crew or is acquainted with someone who has. A vessel's fishing success in terms of number and type of fish can

not be accurately judged even after a trip has been taken since a boat's fish catch may vary from trip to trip depending upon such exogenous factors as sea conditions and fish behavior. In lieu of extensive first hand experience an individual can check on a boat's catch reputation by consulting knowledgeable friends and relatives.

The above description of sources of information used by patrons to select a particular boat indicates that residents more often rely on previous experience and personal recommendations than do visitors. These results suggest that residents may be better informed than visitors as to the friendliness of the boat crews and the catch records of the various charter boats.

3.4.2 Information Search

Patrons were questioned as to how many charter boats they seriously considered prior to selecting a particular boat for their fishing trip. A large majority of patrons limited their comparison shopping to less than three boats, with close to half considering only one boat (Table 3.14). The mean number of boats seriously evaluated was 1.9.

Using a main-effects analysis of variance (ANOVA) procedure, the relationship between the source of information used to evaluate different boats and the number of boats considered was examined. The analysis revealed that only the recommendations of friends and a personal visit to the boat harbor were significantly related at the 0.05 level with the number of boats evaluated. An examination of the means showed that the number of boats evaluated declined as the importance placed on the recommendations of friends increased. Conversely, the number of boats considered varied directly with the importance placed on a personal visit to the boat docks.

Both resident and non-resident patrons generally perceived moderate or no difference among charter boats with regard to the price of the trip and the quantity and type of fish caught (Table 3.15). On the other hand, customers reported that boats showed moderate to large variation with respect to the comfort features offered and the service of the boat personnel.

Survey respondents were almost evenly divided with respect to satisfaction with the quantity and quality of information available for making comparisons among charter boats (Table 3.16). Six percent of the patrons reported the quality but not the quantity of information was sufficient and 3% stated that the quantity but not the quality was adequate.

3.5 Patron Satisfaction

The survey included a number of measurements of customer's satisfaction with their charter fishing experience. Results indicate that the majority of patrons had a favorable experience.

Table 3.14 Number of Different Charter Boats Seriously Considered by Patrons Before a Particular Boat Was Selected

Number of Boats Considered	Percent (N=249)
1	41%
2	26
3	23
4	4
5	1
Over 5	2
No Response	2
TOTAL	99%(a)

Note:

(a) Deviation from 100% due to rounding error

$\overline{X} = 1.9$

Table 3.15 Patrons' Perceptions of Differences in Charter Boat Attributes

Attribute	Perceived Difference (N=249) No Difference	Moderate Difference	Large Difference	No Response	TOTAL
Quantity of Fish Caught	30%	47%	21%	2%	100%
Type of Fish Caught	37	45	16	2	100
Price of Trip	30	50	18	2	100
Comfort Features of Boat	17	53	28	2	100
Service of Captain and Crew	14	42	41	2	100

Table 3.16 Patron Satisfaction With Quantity and Quality of Information Available for Making Comparisons Among Charter Boats

Satisfied With	Percent (N=249)
Both quantity and quality	46%
Neither quantity nor quality	39
Quantity but not quality	3
Quality but not quantity	6
No Response	6
TOTAL	100%

For example, patrons were asked to rate the chances of taking another fishing trip in Hawaii, if they were in the state. The rating scale ranged from 0 (definitely would not) to 10 (definitely would). The average observed rating was 7.4 (Table 3.17). Customers on average gave charter fishing in Hawaii a favorable image rating compared with other deep sea fishing locales (Table 3.18). The average rating on a scale of 1 (unfavorable) to 10 (favorable) of those patrons who had a basis for making a comparison was 6.4. With regard to their satisfaction with the particular boat they chartered, 70% of the customers indicated that they would probably or definitely charter the same boat again.

As discussed above, catching fish may be only one of a number of different motives for taking a charter trip. To examine the influence of catch success on patrons' satisfaction with their fishing trip, patrons were asked whether they intended to go charter fishing in Hawaii again given the amount and type of fish they caught on their intercepted trip. A comparison was then made in the response to this question between patrons who caught at least one fish and patrons who caught nothing. The hypothesis that there was no difference in response between the two groups of patrons could not be rejected at the 0.05 level.

Information for making comparisons among boats may play an important role in patrons' satisfaction with their charter experience since the objective of the information search is to obtain the best buy. Seventy-nine percent of the patrons who reported both the quality and quantity of information to be adequate indicated that they would probably or definitely charter the same boat again. Sixty-three percent of the patrons who felt the quality and quantity of information was inadequate would charter their boat a second time, a difference in proportions significant at the 0.05 level.

Table 3.17 Patrons' Reported Chances of Taking Another Charter Fishing Trip if They Were in Hawaii Next Year

Rating	Percent (N=249)
0 Definitely Would Not	8%
1	2
2	3
3	2
4	2
5 Neutral	9
6	4
7	5
8	11
9	6
10 Definitely Would	46
No Response	1
TOTAL	99%(a)

Note:

(a) Deviation from 100% due to rounding error

Table 3.18 Patrons' Image Ratings of Charter Fishing in Hawaii Compared to Charter Fishing Elsewhere

Image Rating Scale	Percent (N=249)
1 Unfavorable	5%
2	1
3	6
4	5
5 Neutral	8
6	6
7	8
8	13
9	5
10 Favorable	12
No Basis for Making Comparison	30
No Response	1
TOTAL	100%

PATRON EXPENDITURES AND ECONOMIC IMPACT ASSESSMENT

4.1 Charter Fishing Expenditures

Patron expenditures associated with charter fishing activities can be classified into two general cateories. The first category includes expenses incurred to charter a boat, travel to the boat, and acquire food, beverages and clothing for a comfortable day of offshore fishing. These costs are called "variable" since the total amount varies according to how many charter trips are taken. Comprising the other category are costs, normally borne by visitors, to travel to Hawaii and acquire food, lodging and amenities during a vacation stay. These costs are called "overhead" since they do not generally change as the number of charter trips taken increase or decrease.

It was hypothesized that variable expenses associated with charter fishing would differ depending on whether a full or half-day charter trip was taken, and on whether the patron was a visitor or a resident of Hawaii. Looking first at half-day and full-day charter fishing expenses (Table 4.1), it was observed that average expenses per trip were $129 for a full-day excursion and $104 for a half-day. A series of pairwise statistical tests was conducted to determine whether half-day and full-day expenses were significantly different on an item by item basis. The results given in Table 4.1 suggest significant differences do not exist. Average expense for charter fees was not significantly lower for half-day trips presumably because there is less sharing of chartering fees for these types of trips. Owing to the absence of significance differences in half-day and full-day expenses, it was decided to group half-day and full-day trips together for purposes of further expense analysis.

Differences were more pronounced in variable charter expenses incurred by visitors and residents. A series of pairwise z-tests were conducted to determine the degree of statistical similarity between charter fishing costs incurred by visitors and residents. Test results presented in Table 4.2 suggest that the expenses borne by the two groups are significantly different. Visitors on average spent $128 per charter trip compared to $89 for Hawaii residents (Table 4.2). It is likely that residents paid less to travel to and from Kewalo Basin because they have their own means of transportation. The relatively low average expenditure on fish taxidermy suggests that residents are less interested in catching trophy fish as opposed to fish for consumption.

As shown in Table 4.3, estimated total visitor expenditures per charter trip for the Kewalo survey agreed closely with CPI-adjusted charter expenses paid by Kailua-Kona patrons in 1976 (NMFS, 1983a). However, differences in individual expenses were noted between the Kewalo Basin and Kailua-Kona surveys. Most are

Table 4.1 Statistical Comparison Between Average Charter-Related Expenditures For Full-Day and Half-Day Trips

Item	Average Expenditure Per Passenger Trip (a) Full-day	Half-Day	Calculated t-statistic
Rental Fee to Charter Boat Operator	$83.34 (181; 56.90)	$89.62 (7; 71.03)	0.284
Transportation from Lodging to Boat and Return	3.90 (86; 5.34)	2.36 (7; 71.03)	0.751
Food and Beverage Intended for Consumption on Fishing Trip	8.20 (198; 6.90)	4.16 (8; 4.88)	1.64 *
Special Fishing Tackle	6.77 (198; 7.11)	0 (8; 0)	0.209
Special Clothing	0.54 (192; 3.21)	1.87 (8; 5.30)	1.12
Sundry Items	2.64 (192; 4.36)	2.41 (8; 2.06)	1.12
Fish Taxidermy	18.79 (192; 77.08)	0 (8; 0)	0.687
Tips to Boat Captain and Crew	3.55 (191; 7.45)	3.59 (8; 4.40)	0.015
Other Fishing Related Expenses	1.01 (192; 12.44)	0 (8; 0)	0.229
TOTAL	$128.74	$104.01	

Notes:

(a) Values in parentheses are sample size and standard deviation, respectively

(*) Significant at the 0.05 level

Table 4.2 Statistical Comparison Between Average Charter-Related Expenditures by Visitor and Resident Patrons

Item	Average Expenditure Per Passenger Trip (a) Visitors	Residents	Calculated t-statistic
Rental Fee to Charter Boat Operator	$84.54 (152; 53.16)	$77.03 (29; 74.33)	0.650
Transportation from Lodging to Boat and Return	4.52 (160; 5.59)	0.59 (33; 0.73)	8.56 *
Food and Beverage Intended for Consumption on Fishing Trip	8.41 (173; 6.80)	6.09 (33; 6.97)	1.77
Special Fishing Tackle	0.61 (173; 7.61)	0.20 (33; 0.98)	1.00
Special Clothing	0.65 (167; 3.60)	0.26 (33; 0.98)	1.20
Sundry Items	2.88 (167; 4.62)	1.39 (33; 1.31)	3.51 *
Fish Taxidermy	21.46 (167; 82.33)	0.76 (33; 0.76)	3.22 *
Tips to Boat Captain and Crew	3.60 (166; 7.70)	3.29 (33; 5.36)	0.279
Other Fishing Related Expenses	1.16 (167; 13.34)	0.05 (33; 0.29)	1.08
TOTAL	$127.83	$89.49	

Notes:

(a) Values in parentheses are sample size and standard deviation, respectively

(*) Significant at the 0.05 level

Table 4.3 Comparison Between Alternative Estimates of Average Charter-Related Expenditures

Item	Average Expenditure Per Passenger Trip		
	Visitors		Residents
	1977 Kailua-Kona Survey (a)	1984 Oahu Survey	
Rental Fee to Charter Boat Operator	$96.10	$84.54	$77.03
Transportation from Lodging to Boat and Return	0.35	4.52	0.59
Food and Beverage Intended for Consumption on Fishing Trip	3.75	8.41	6.09
Special Fishing Tackle	0.09	0.61	0.03
Special Clothing	0.98	0.65	0.26
Sundry Items	1.11	2.88	1.39
Fish Taxidermy	18.37	21.46	0.76
Tips to Boat Captain and Crew	2.44	3.60	3.29
Other Fishing Related Expenses	0.07	1.16	0.05
TOTAL	$123.26	$127.83	$89.49

Note:

(a) Source: NMFS (1983a). Prices adjusted to April 1984 dollars (1967 = 100) using consumer price index for all urban consumers: selected areas: selected areas, all items index-Honolulu (USDL, 1977-1984)

attributable to differences in transportation costs, charter fees, and costs of food and beverages brought aboard.

Overhead expenses associated with charter fishing were also measured. These expenses are made by visitors to vacation in Hawaii. None of the residents surveyed reported that their fishing trip required an overnight stay away from home. Detailed data were collected on visitors' out-of-pocket expenses for the previous day spent in Hawaii. Information on airfare was also obtained. These data permitted construction of daily expense budgets for visitors. If an expenditure item was reported to be included in a tour package plan it was excluded from the estimated average expenditure. Table 4.4 lists the percentage of visitors who indicated a particular expense was part of a package. Resulting expenditure estimates summarized in Table 4.5 reveal that visitors spent on average $182 per day in Hawaii, exclusive of charter fishing costs. This value was higher than the CPI-adjusted average daily visitor expenditure values calculated by the Hawaii Visitors Bureau (1982). It is also higher than, but certainly closer to, the adjusted average daily expenditure amount reported for Kailua-Kona, Hawaii charter patrons (NMFS, 1983a). These differences are perhaps linked to the fact that the income level of visitors in the Kewalo Basin survey group is higher than the income of the average Hawaii visitor, and therefore a higher standard of living while on vacation is expected.

4.2 Statewide Economic Impact Estimation

The procedure for estimating direct, indirect and induced sales impacts was as follows. First, a distinction was made between resident and visitor variable charter expenses. Statistical test results reported above suggested that resident and visitor variable charter fishing costs should be treated separately. Resident variable charter expenses (Table 4.2) were allocated to general expense categories for which Type I output multipliers have already been calculated by DPED (1984). Treatment of visitor expenses was more complicated because both travel overhead and variable charter fishing costs had to be included in the calculations. Visitor overhead expenses (Table 4.5) were adjusted in three ways before allocating them to the general expense categories used for economic impact assessment purposes. First, daily expenses were expanded to trip expenses by multiplying each item by a factor of 17.49, the average number of nights per vacation trip estimated in the mail-back portion of the survey. This adjustment yielded an estimate for total vacation costs. The vacation costs were then divided by 1.207 to reflect the finding that 1.207 charter trips were taken on average during a Hawaii vacation by visitors responding to the survey. This adjustment yielded an estimate of total trip overhead per charter trip taken.

Table 4.4 Percentage of Patrons Who Reported an Expenditure was Included in a Tour Package Plan

Expenditure Included in Package	Percent (N=176)
Rental Fee to Charter Boat Operator	11%
Transportation from Lodging to Boat and Return	8
Food and Beverage	22
Lodging	47
Entertainment and Sightseeing Tours	20
Car Rental	17
Inter-island Airfare	14
Overseas Airfare	46

Table 4.5 Comparison Among Alternative Estimates of Average Non-Charter Expenditures

Item	Average Expenditure Per Visitor Day (a)		
	1984 Oahu Survey	1980 HVB Visitor Expenditure Survey (b)	1977 Kailua-Kona Survey (b)
Food and Beverage	$ 25.38	$23.63	$ 26.17
Lodging	32.86	30.60	21.35
Entertainment and Sightseeing Tours	14.86	5.24	1.52
Car Rental	5.80	3.79	6.37
Inter-island Airfare	8.23	3.17	(c)
Other Transportation	1.56	2.62	0.67
Gifts and Souvenirs	21.30	7.58	17.34
Clothing	11.94	6.73	7.48
Tips	1.23	(c)	1.21
Sundry Items and Other Expenditures	10.81	4.43	4.50
Subtotal	133.97	87.79	86.61
Overseas Airfare	47.72	(c)	34.90
TOTAL	$181.69		$121.51

Notes:

(a) Includes only independent (non-tour), out-of-state visitors

(b) Sources: Hawaii Visitor Bureau (1982) and NMFS (1983a). Prices adjusted to April 1984 dollars (1967 = 100) using consumer price index for all urban consumers: selected areas, all items index - Honolulu (USDL, 1977-1984)

(c) Data not reported

Finally, overhead costs had to be adjusted to account for the multiple purpose nature of a trip to Hawaii. It is not valid to attribute all overhead costs to charter fishing if respondents' motives for visiting Hawaii are only partially related to charter fishing. Survey results showed that on average vistors assigned 20% importance to charter fishing in their decision to visit Hawaii. Based on this knowledge, total trip overhead per charter trip was adjusted downward. Multiplying overhead by 0.20 yielded an overhead estimate that accommodated multiple purpose vacation motives.

Adjusted overhead costs and variable charter expenses for visitors were allocated to similar categories used for residents. A simple weighted average of expenses was calculated to reflect the estimated proportion of residents (24 %) and visitors (76 %) comprising Hawaii's charter patron population (Samples et al., 1984). Although these estimates are based on 1983 data, they are the best currently available. Weighted average expenses (Table 4.6) totaled $534 per charter fishing excursion. Total direct sales impacts associated with charter patron expenditures were then calculated by multiplying each general cost category item by 73,780, the estimated number of charter trips taken in 1983 (Samples et al., 1984). Using this formula, it was estimated that $39.4 million is spent each year by charter patrons as a result of their demand for charter fishing experiences. Annual direct and indirect sales impacts due to charter patron expenditures totaled $52.4 million. This value is obtained by multiplying direct expenditures in each cost category by a corresponding Type I multiplier calculated elsewhere by DPED (1984) and then summing across all cost categories.

Table 4.6 Estimates of Annual Sales Impacts Created by Patrons' Expenditures in Hawaii

Expense Category	Average Weighted Expenditure Per Charter Trip	Total Direct Sales Impact	Total Direct and Indirect Sales Impact
Textile and Apparel	$ 26	$ 1,918,000	$ 2,321,000
Air Transportation	130	9,591,000	11,893,000
Other Transportation	20	1,476,000	1,978,000
Eating and Drinking Places	58	4,279,000	6,033,000
Other Retail Trade	85	6,271,000	7,776,000
Hotel	75	5,534,000	8,024,000
Other Services	56	4,132,000	5,413,000
Charter Fishing	84	6,198,000	9,049,000
TOTAL	$534	$39,399,000	$52,487,000

PATRON FISH CATCH

5.1 Catch Success

During the dockside interviews, patrons were asked what type and number of fish they personally caught and the number and type of fish caught by other patrons on the boat. Interviewers verified patrons' responses by examining the fish displayed on the docks. The number of fish caught and released at sea was not recorded but is not believed to be significant.

Survey results showed that of the 727 patrons interviewed, 45% caught at least one fish. Seventy-nine percent of the charter vessels inspected caught one or more fish. Although a majority of patrons did not catch any fish, individual catches were occasionally very high. For example, the recorded catch of one patron was 17 tuna during a full-day charter trip.

5.2 Catch Rates By Fish Type

Estimated average catch rates per patron and per boat for a full day trip are presented in Table 5.1. Among the fish types commonly landed by charter boats were tuna, mahimahi (Coryphaena hippurus), billfish, ono (Acanthocybium solandri), ulua (Caranx spp.), barracuda (Sphyraena barracuda) and shark. Billfish included blue marlin (Makira nigricans), black marlin (Makaira indica), striped marlin (Tetrapterus audax), sailfish (Istiophorus orientalis) and shortbill spearfish (Tetrapterus angustirostis). Tuna included aku (Katsuwonus pelamis) and ahi (Thunnus albacares).

Data compiled by NMFS (1983b) from 1949-78 indicate that the commercial catch of pelagic fish species in Hawaiian waters exhibits marked seasonal variation. It is likely that this variation reflects distinct seasonal changes in the availability of individual species. The charter patron survey was conducted from early March through August. An examination of the NMFS data revealed that the average commercial catch for the months of March through August tends to be higher than the monthly average calculated over the entire year. The percentage difference in the commercial catch by fish type during March through August as compared to January through December is as follows: billfish- 8% higher; mahimahi- 21% higher; ono- 27% higher; tuna- 35% higher; shark - no difference. Ulua and barracuda were not included in the NMFS data.

Although it is recognized that seasonal trends in commercial fish landings are a function of such factors as gear type, fishing location and fishing range, the NMFS data provides the most reliable estimate of seasonal variation in fish availability in Hawaiian waters. To compensate for the seasonality of the patron survey data, estimated average catch rates per patron and per boat were adjusted by constructing indices using NMFS (1983b)

Table 5.1 Average Catch Rates for Full-Day Charter Trips for Various Fish Types: Per Patron and Per Boat

Fish Type	Average Catch Per Full-day Trip(a)	
	Per Patron	Per Boat
Tuna(b)	0.497 (686; 1.447)	1.855 (670; 4.461)
Mahimahi	0.165 (691; 0.510)	0.735 (679; 2.080)
Billfish(c)	0.103 (691; 0.331)	0.332 (681; 0.585)
Ono	0.045 (691; 0.263)	0.174 (679; 0.523)
Ulua	0.006 (691; 0.107)	0.018 (681; 0.265)
Barracuda	0.002 (691; 0.054)	0.007 (681; 0.085)
Shark	0.001 (691; 0.038)	0.009 (681; 0.093)
TOTAL	0.829 (680; 1.559)	3.078 (688; 4.839)

Notes:

(a) Values in parentheses are sample sizes and standard deviations, respectively

(b) Includes aku and ahi

(c) Includes blue marlin, black marlin, striped marlin, sailfish and shortbill spearfish

data. Separate indices were developed for each species by calculating the ratio of average monthly catch for January through December to the average monthly catch for the survey months of March through August. Average catch per patron and per boat for each species was then multiplied by the corresponding index to arrive at a seasonally adjusted average catch value. Adjusted catch rates by fish type are displayed in Table 5.2.

As shown in Table 5.3, the catch composition of charter boats on Oahu reported in the charter boat owner survey (Samples et al., 1984) closely coincides with data on boat catch collected in the patron survey (adjusted for seasonality). Both surveys indicate that, in terms of numbers, tuna dominate the catches of charter boats, followed by mahimahi and billfish. These three fish types comprise about 90% of the total catch. Ono, ulua, barracuda and shark are of relatively less significance.

Patrons were asked in the pilot survey to rate the importance of catching specific types of fish along a three-point scale: "not important", "important" or "very important". Patrons appeared to be most interested in catching billfish and mahimahi (Table 5.4). When compared with ratings supplied by charter boat owners in the survey by Samples et al. (1984), it appears that boat owners significantly overrate the importance to patrons of aku, ahi, mahimahi and ono catches. Owners tend to underrate the desirability of catching a shark.

5.3 Factors Associated with Fish Catch

A series of one-way ANOVA tests were used to examine the association between fish catch per patron and per boat and a number of charter trip and patron characteristics (Table 5.5). The results indicate that catch per patron differs according to the importance patrons place on charter fishing, patron's residency status, the sea conditions during the fishing trip and the particular charter boat booked. The null hypothesis that the number of previous charter fishing trips taken by patrons in or out of Hawaii (a surrogate for experience) had no impact on fish catch could not be rejected at the 0.05 significance level. An inspection of the means revealed that residents tended to catch more fish than visitors. Furthermore, fish catch was positively related to the importance a patron placed on charter fishing. Higher catches are also correlated with smooth sea conditions. Boat catch was significantly related at the 0.05 level only to the residency status of the interviewee and the charter boat specified.

The above results would suggest that boats differ in their catch rates and that the boats selected by residents generally have higher catches than those chosen by visitors. To test whether residents and visitors tended to select different boats, a chi-square analysis was performed comparing the frequency distributions of residents and visitors among the 24 boats included in the survey. The distributions were significantly

Table 5.2 Average Catch Rates for Full-Day Charter Trips for Various Fish Types Adjusted to Compensate for Seasonal Sampling Time Frame of Patron Survey: Per Patron and Per Boat

Fish Type	Index(a)	Adjusted Average Catch Per Full-day Trip	
		Per Patron	Per Boat
Tuna	0.74	0.368	1.374
Mahimahi	0.82	0.136	0.607
Billfish	0.92	0.095	0.307
Ono	0.78	0.035	0.137
Ulua	(b)	0.006	0.018
Barracuda	(b)	0.002	0.007
Shark	1.00	0.001	0.009
TOTAL		0.643	2.459

Note:

(a) Developed from monthly historic landings data provided by NMFS (1983b)

(b) Data needed to calculate index not available

Table 5.3 Comparison of Species Composition of Charter Boat Catches Estimated From Patron Survey and Boat Owner Survey

Fish Type	Percent of Total Boat Catch	
	Patron Survey (a)	Boat Owner Survey (b)
Tuna	56%	49%
Mahimahi	25	26
Billfish	13	14
Ono	6	9
Ulua	1	1
Barracuda	0	1
Shark	0	1
TOTAL	101% (c)	101% (c)

Notes:

(a) Adjusted for seasonality of patron survey (see Table 5.2)

(b) Source: Samples et al. (1984)

(c) Deviation from 100% due to rounding error

Table 5.4 Importance of Catching Various Fish Types as Indicated by Patrons and Charter Boat Owners

Fish Type	Importance Rating (Patrons, N=29 Boat Owners, N=73) Not Important(a) Patrons	Not Important(a) Boat Owners(c)	Important/Very Important(b) Patrons	Important/Very Important(b) Boat Owners(c)	No Response/Not Applicable Patrons	No Response/Not Applicable Boat Owners(c)
Black Marlin	17%	0%	82%	86%	0%	14%
Blue Marlin	14	0	86	90	0	10
Sailfin Marlin	21	1	79	79	0	21
Striped Marlin	17	1	75	88	7	11
Shortnose Marlin	27	4	65	84	7	12
Aku	48	14	34	76	17	11
Ahi	24	0	55	92	17	8
Mahimahi	24	0	65	92	10	8
Ono	17	58	58	88	24	9
Ulua	34	14	41	64	24	23
Barracuda	62	39	38	43	0	18
Shark	59	54	41	29	0	18
Bottomfish	59	40	34	40	7	21

Notes:

(a) Reported as very undesirable/somewhat undesirable in boat owner survey
(b) Reported as highly desirable/somewhat desirable in boat owner survey
(c) Source: Samples et al (1984)

Table 5.5 Statistical Tests of Relationships Between Fish Catch Per Patron and Per Boat, and Various Charter Trip and Patron Characteristics

Characteristic	Calculated F-Statistic(a) Catch Per Patron	Catch Per Boat
Importance of Charter Fishing as a Vacation or Leisure Activity (b)	5.95 (674)	1.45 (682)
Residency (c)	8.65 * (680)	14.18 * (688)
Total Number of Previous Charter Fishing Trips During the Past Five Years (d)	2.01 (221)	1.52 (227)
Number of Previous Charter Fishing Trips in Hawaii During the Past Five Years (e)	0.63 (221)	0.21 (227)
Sea Conditions (f)	5.11 * (680)	2.81 (688)
Charter Boat Booked (g)	3.88 * (477)	6.31 * (483)

Notes:
(a) Sample sizes in parentheses
(b) Class levels: not important, moderately important, very important
(c) Class levels: Hawaii resident, out-of-state visitor
(d) Class levels: 0 trips, 1-3 trips, >3 trips
(e) Class levels: 0 trips, 1-2 trips, >2 trips
(f) Class levels: <4 ft., 4-8 ft., >8 ft.
(g) Class levels: 9 charter boats selected from sample
(*) Significant at the 0.05 level

different at the 0.05 level. However, because the sample was not randomly drawn for a particular boat, it cannot be concluded that different boats tend to attract significantly different types of clientele.

PATRON VALUATION OF THE CHARTER FISHING EXPERIENCE

6.1 Concept of Patron Valuation

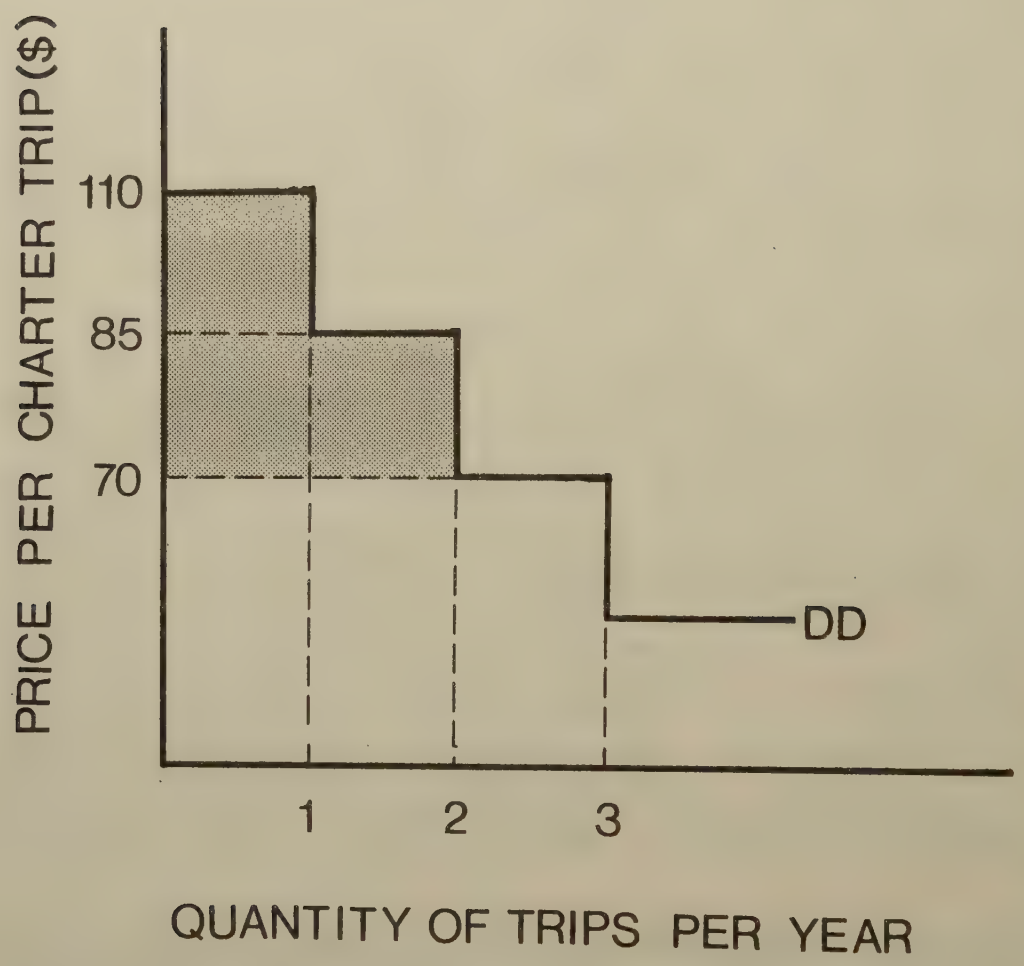
A principal component of the social value of charter fishing in Hawaii is the net welfare gain that accrues to patrons as a result of being able to take charter trips at prevailing market prices rather than doing without charter fishing altogether. Although expenditures for charter fishing are readily observable, the value patrons place on the activity over and above actual costs is not normally expressed. From a policy perspective, however, it is important to know what this value is because it represents what patrons would lose if charter fishing was for some reason no longer available.

Economists use the term "consumer surplus" to refer to a consumer's monetary valuation of a good or service above and beyond the costs of obtaining it. In the context of charter fishing, consumer surplus is the amount of money that a patron would be willing to pay to take as many charter trips as he desires at prevailing prices. The concept of consumer surplus is illustrated in Figure 6.1. A hypothetical patron's demand for charter trips at alternative prices is shown as DD. At a price of $70 per trip, the patron takes 3 trips per year. The demand function indicates, however, that the patron would be willing to pay as much as $110 for the first trip and $85 for the second trip. Consequently, the patron receives a surplus equal to $55 [(110-70)+(85-70)] . This amount is the individual's consumer surplus. Other patrons, each with their own particular demands for charter fishing, also generally realize some consumer surplus. The summation of consumer surplus across all patrons equals the social value of charter fishing as a recreational activity.

One approach to estimating consumer surplus is the contingent valuation method (CVM). This survey-based technique is particularly useful when market data needed to parameterize a demand function are not available. The method entails presenting a hypothetical market situation to survey interviewees, and then posing carefully worded questions that encourage respondents to divulge how they would behave within the market construct. Survey responses are then used to calculate consumer surplus using a variety of statistical techniques.

In the fishing valuation questionnaire, three different contingent valuation formats were used to measure consumer surplus per charter trip for a typical patron: maximum willingness to pay, contingent demand, and take-it-or-leave-it offer. The first format entailed directly asking patrons what is the most they would pay to take a charter fishing trip, assuming they would have to pay the amount every time they went fishing.

Figure 6.1 Hypothetical Demand Curve and Consumer's Surplus For Charter Fishing Trips



The underlying presumption was that maximum willingness to pay (WTP), minus actual charter fishing fees, yields an estimate of patron consumer surplus.

The second type of format employed was to ask patrons how many trips they would take annually at a specified fixed price per trip. Here the interest was in estimating a demand curve for a representative patron. Consumer surplus could then be estimated by calculating the area below the estimated demand curve and above the prevailing price line. In the survey questionnaire, patrons were randomly assigned different fixed prices to which to respond. Twenty different prices, varying from $5 to $350, were used. Each patron was given only one price and was asked to indicate how many trips per year would be demanded at that price from a list ranging from 1 to "over 12". It was an oversight that the choice of zero trips was not included in the fixed response listing. Despite this omission, many patrons nevertheless wrote "0" as the number of trips they would demand at the price specified to them.

The third contingent valuation format, called the "Take-It-Or-Leave-It Offer", involved determining patrons' willingness to purchase a fishing license that would permit them to go charter fishing for a day. In the survey questionnaire, respondents were randomly assigned to one of seven different cells. Each cell was distinguished by a hypothetical license price ranging from $5 to $245. Patrons were asked to simply indicate "yes" or "no" regarding their willingness to buy a daily license at the specified price. Patrons were informed that the license was required to go charter fishing, and that regular charter fishing fees would still have to be paid. Patrons' binary responses to this question were used to calculate expected consumer surplus using a logit model (Samples, 1981). An overview of the statistical procedure used to calculate expected consumer surplus is given in Appendix B.

Consumer surplus estimates were obtained using all three methods. Results are analyzed and compared in the following sections.

6.2 Maximum Willingness to Pay Results

Respondents' reported maximum willingness to pay for a charter fishing trip ranged between $0 and $2000. Nine low bids (WTP<$50) were considered illegitimate and were eliminated from further analysis because charter trips are not generally available at these prices. One individual reported a WTP of $2000 and was excluded as a statistical outlier. A frequency distribution of reported bids is given in Table 6.1. The median and mean observed WTP values were $100 and $105 respectively. The 95% confidence interval for the calculated mean was $98 $\leq$ WTP $\leq$ $112.

Table 6.1 Frequency Distribution of Maximum Willingness to Pay for Individual Charter Fishing Trips (a)

Price Range	Percent (N = 237)
50-100	79%
101-150	12
151-200	5
201-250	1
251-300	1
301-350	1
351-400	1
TOTAL	100%

Note:

(a) For exact wording of question see Appendix A, "Valuation Questionnaire," question #20

Ordinary least squares regression analysis was employed to test for hypothesized relationships between WTP and a host of potentially important explanatory variables including: age, income, catch success during the intercepted trip, residency status, reported importance of charter fishing as a leisure or vacation activity, and number of charter trips taken in Hawaii during the in last five years. Using linear and semi-logarithmic model specifications, the hypotheses could not be rejected at the 0.05 level that the independent variables, individually and collectively, did not have a statistically significant impact on WTP.

Average consumer surplus per trip was calculated by subtracting the expected cost of a charter fishing trip from maximum willingness to pay. Prices paid for charter trips vary depending on whether the charter is offered on a share or private basis. A price of $70, the median price actually paid by survey respondents, was selected to calculate consumer surplus. Selection of this price resulted in an average consumer surplus estimate of $35 ($105-$70). The 95% confidence interval is $27 $\leq$ CS $\leq$ $42.

6.3 Contingent Demand Analysis Results

A variety of functional forms and model specifications were experimented with to estimate a demand curve for a representative charter patron. Linear, semi-logarithmic and inverse price functional forms were estimated. Various combinations of explanatory variables (in addition to price) such as income, catch success on intercepted charter trip, previous charter fishing experience and importance of charter fishing were also included in model pre-testing. Each model was estimated using ordinary least squares regression.

All explanatory variables other than own-price were consistently insignificant at a prespecified cutoff level of 0.25 and, therefore, dropped from the estimating equation. The functional form yielding the highest adjusted R^2 was the inverse price model:

$$Q = \underset{(0.23)}{2.45} + \underset{(4.43)}{48.35/P} \qquad (6.1)$$

where Q is estimated annual demand and P is the price per charter fishing trip. The adjusted R^2 for the equation was 0.32, and the calculated F-value of 119.06 was significant at the 0.01 level.

Average annual consumer surplus per trip was calculated by first integrating Equation 6.1 to obtain annual consumer surplus. The lower limit integration was set at $70. Selection of an upper limit of integration was more complicated due to the fact that Equation 6.1 does not intersect the price axis at a finite value. Because the upper limit of integration is unbounded from above, consumer surplus estimates are sensitive to the range of

integration. Choice of an upper integration limit is guided by the fact that on average, respondents stated they would be willing to pay no higher than $105 per trip. It seems reasonable, therefore, that the upper limit of integration should lie in the neighborhood of this value. Estimated annual consumer surplus was subsequently averaged across the number of trips demanded to determine average consumer surplus per trip. At $70 per trip, Equation 6.1 predicts that 3.1 trips will be demanded annually. This value is considerably higher than the average number of trips actually taken each year by resident charter patrons. The overestimate may be the result of not including a response category of "0 trips" in the question design. Table 6.2 summarizes various estimates of consumer surplus per trip (assuming 3.1 trips per year) for alternative upper limits of integration.

6.4 Take-It-or-Leave-It Offer Results

Responses to the Take-It-or-Leave-It license fee offer are summarized in Table 6.3. As suspected, almost all individuals were willing to pay $5 for a daily license to go charter fishing. On the other hand, only 2% were willing to pay a fee of $245. Following the statistical model explained in Appendix B, observed responses of individuals within subgroups to various license prices were used to estimate the following linear logistic model using weighted generalized least squares to correct for heteroskedasticity:

$$\ln(P/1-P) = \underset{(1.05)}{2.31} - \underset{(0.007)}{0.028}X \qquad (6.2)$$

where P is the probability of accepting a given offer, and X is a specified license fee. Estimated standard errors are given in parenthesis. The model was estimated using a weighted generalized least squares regression to correct for heteroskedasticity. The adjusted R^2 was 0.74, and the F-value of 17.9 was significant at the 0.001 level.

Solving Equation 6.2 for P gives the logistic function:

$$P = 1/(1+\exp(-(2.31-0.028X)) \qquad (6.3)$$

As described in Appendix B, $E(x) = \int_0^K P(x)dx$. The lower limit of integration was set at 0 because all license fee offers were non-negative in the survey. For an upper limit of integration (K), a value of $200 was selected because P($200) = 0.003. Solving for the definite integral of Equation 6.3 yielded a value of $84. Experimentation with values of K as low as $135 did not alter the estimated willingness to pay by more than 8%.

6.5 Aggregate Consumer Surplus Estimates

The values of charter patrons' average consumer surplus per trip estimated from the three different contingent valuation

Table 6.2 Estimates of Consumer's Surplus Per Trip Using Alternative Upper Limits of Integration in Contingent Demand Analysis (a)

Upper Limit of Integration	Estimated Consumer Surplus Per Trip
$400	$284
250	160
150	74
120	44
110	38
105	33
100	29

Note:

(a) Estimated equation is $Q = 2.45 + 48.35/p$; lower limit of integration set at 70

Table 6.3 Response to 'Take It or Leave It' Offer Involving Purchase of Daily Charter Fishing License (a)

Hypothetical License Price Per Trip	Cell Size	Percent Willing to Pay License Price
$ 5	39	90%
20	38	50
35	32	38
80	27	22
135	34	3
185	36	6
245	42	2

Note:

(a) For exact wording see Appendix A, "Valuation Questionnaire," question #17

formats range between $35 and $284. The range narrows to $35 to $85 if it is assumed that the upper limit of integration in the contingent demand is $150 or less. If a mid-point estimate of $57 is used as an indicator of average consumer surplus per trip, then the 73,780 trips taken in 1983 generated on estimated $4.2 million in patron benefits. This amount of money, represents the aggregate value that patrons place on being able to take 73,780 trips annually at an average cost of $70 rather than doing without charter fishing in Hawaii altogether. Alternatively stated, it is a monetary measure of the welfare loss that patrons would incur if charter fishing was for some reason no longer available in Hawaii. This measure is sensitive to the selection of an estimated consumer surplus value of a fishing trip. For example, if $35 (obtained from the open-ended willingness to pay question) is used as a baseline consumer surplus estimate, then aggregate consumer surplus value for charter fishing is estimated to be $2.6 million. Alternatively, use of $85 (obtained from the contingent demand question) is adopted, estimated aggregate consumer surplus increases to $6.3 million. Quite likely, therefore, aggregate consumer surplus for charter fishing trips lies in the range of $2 million to $7 million. Furthermore, due to the tendency that open-ended willingness to pay questions tend to generally generate lower estimates of consumer surplus compared with other techniques, the true value probably lies at the upper end of this range.

VALUE OF CHANGES IN CATCH RATES AND VESSEL CHARACTERISTICS

From a fish management policy perspective, it is important to determine whether patron consumer surplus is sensitive to changes in the quality attributes of a charter trip. Quality increments or decrements would expectedly shift a patron's demand curve for charter fishing via a change in a patron's willingness to substitute consumption of charter fishing trips for other goods and services at the margin. As a consequence of this shift in preferences, a patron would be willing to pay a different amount at the margin for all charter trips taken. In the case of a quality improvement, such as an increase in average number of fish landed per trip, marginal willingness to pay for charter trips would increase. The converse holds true for a quality decrement. The change (either positive or negative) in marginal willingness to pay, aggregated over the interval of total trips demanded, is the value to a patron of the quality shift.

Two techniques were adopted in this study to measure the value to patrons of small changes in the quality attributes of charter boats. The first, labeled hedonic price analysis, capitalizes on the notion that market prices reflect levels of quality attributes embodied in goods or services. The second technique, called contingent ranking analysis, measures tradeoffs between quality attributes through direct questionning of survey subjects. Both methods assume that consumers attempt to maximize utility subject to a budget constraint. Utility functions are defined in terms of attributes or characteristics of goods and services, following the theoretical work of Lancaster (1966).

7.1 Hedonic Price Analysis and Results

The hedonic price approach postulates that goods and services purchased by consumers embody desirable quality attributes. Households adjust the mix of goods and services purchased to achieve an optimal level of quality attributes in the most cost efficient manner possible. Observed market prices for various products (including charter fishing excursions) therefore reflect: 1) consumers' marginal willingness to pay for product attributes, and 2) the marginal cost borne by suppliers to provide these attributes (Rosen, 1974).

In the specific context of charter fishing in Hawaii, it is hypothesized that the observed variance in prices of charter boat fishing trips around the state reflects differences in levels of quality attributes among boats as represented by the equation: $Pi=P(Zi)$, where Pi is the average price paid per trip for the ith vessel, and Zi is a quantity vector of objective attributes associated with the ith fishing vessel. The equation linking market price to quality attributes is called the hedonic price

gradient for charter fishing trips. A convenient feature of the price gradient is that the partial derivative of P with respect to a particular attribute equals the implicit price of the attribute. If the market for charter boat fishing services is such that all charter boats attract similar types of clientele, then the implicit price equals a respresentative patron's marginal willingness to pay for an increment of a particular quality characteristic. Results of this study do not provide sufficient reason to reject the hypothesis that boats tend to attract the same types of patrons. Thus, for purposes of analysis it is assumed that the price gradient maps a representative patron's bid curve for various bundles of quality attributes.

Statistical estimation of the hedonic price gradient for charter fishing trips required identification of all dependent and independent variables. The mail questionnaire survey of Hawaii charter boat owners conducted by Samples et al. (1984) provided sufficiently detailed information on 73 different charter fishing vessels. The patron survey results indicated that of the four kinds of fishing trips booked (full-day private, half-day private, full-day share, half-day share), full-day share trips were taken by a majority of the patrons interviewed. Therefore, the price for a full-day share charter fishing trip was selected as the dependent price variable. A subsample of 31 vessels was selected consisting of those charter boats that provided price data on full-day share trips. A difference between means statistical test was conducted to determine if the charter fee for a full-day share trip differed significantly between the total sample of 73 vessels and the subsample of 31 vessels. No significant difference could be detected at the 0.10 level.

The next task was to identify attributes of fishing boats that were relevant to charter boat customers. During the Kewalo Basin pre-survey, 29 patrons were asked to rate the importance of a range of charter fishing trip attributes along a three-point scale: "not important", "important", or "very important". As shown in Table 7.1, the attributes rated important or very important by 85% or more of the patrons interviewed were: 1) catching a marlin or mahimahi; 2) fishing skill of the captain and job performance of the mate; 3) friendliness of the boat personnel; 4) safety features of the boat; 5) comfort features of the boat; , and 6) price of the fishing trip. The survey of charter boat owners provided data to calculate the number of various types of fish caught during 1982 by individual charter boats. The average number of marlin and mahimahi caught per trip by each boat was calculated by dividing the annual value for each species by the number of days the boat was used for charter fishing.

The catch record of the boat is a good indicator of the fishing skill of the captain as well as the job performance of the mate and may be used as a proxy measure of these

Table 7.1 Patrons' Importance Ratings of Boat and Crew Attributes

Attribute	Importance Rating (N = 29) Very Important	Important	Not Important	No Response/ Not Applicable	TOTAL
Safety Features of the Boat	90%	10%	0%	0%	100%
Fishing Skill of the Captain	90	10	0	0	100
Job Performance of the Mate	83	17	0	0	100
Friendliness of the Captain and Crew	79	21	0	0	100
Comfort Features of the Boat Such as Restrooms, Sofas, Etc.	45	45	10	0	100
Price of the Fishing Trip	34	52	14	0	100
Presence of Friends or Family Aboard the Boat	21	38	41	0	100
Provision of Food and Beverages	14	7	65	14	100
Services Such as Cleaning and Storing Fish	14	59	24	3	100
Overall Physical Appearance of the Boat	14	65	21	0	100
"Newness" of the Boat	3	24	72	0	99(a)

Note:

(a) Deviation from 100 percent due to rounding error.

characteristics. No objective measure could be found for the friendliness of the boat crew towards patrons.

The comfort features of the boat would include such items as air conditioning, restrooms, sofas and stereo systems. However, the hedonic price model breaks down for attributes scaled 0 or 1 (i.e., absent or present), because choice of the attributes is consistent with any valuation of the attribute above its cost. Boat length, on the other hand, is a continuous variable and is a suitable measure of comfort in terms of spaciousness and smoothness of ride. Boat length may also serve as a measure of vessel safety.

In terms of other boat services, a majority of patrons rated cleaning and storing fish as important or very important but provisions of food and beverages was generally considered unimportant. For the purposes of hedonic gradient estimation, a service index was calculated based on a series of questions asked in the boat owner survey. The index was twice the sum of the number of services reportedly offered by each boat. The average value for the index is 10.4.

Linear and semi-logarithmic hedonic price models, using various combinations of explanatory variables, were pre-tested using ordinary least squares regression. It was found that boat length variable was consistently insignificant and was dropped from all final equations. The marlin catch rate variable was robust and significant under all model specifications. This held true for the service index variable as well. The mahimahi catch rate variable, however, reversed signs depending on model specification and was not consistently significantly different from zero. The final model was linear in attributes:

$$\begin{array}{lccccc} P = & 47.24 & + & 23.16\ MC & + & 2.75\ S \\ & (13.63) & & (8.00) & & (1.26) \end{array} \qquad (7.1)$$

where P is predicted full-day share trip price, MC is marlin catch per day of fishing, and S is a composite index of services offered including beverage, fishing cleaning, free lunch and hotel pick-up. The adjusted R^2 for the model was 0.30, and the calculated F-value of 4.00 was significant at the 0.01 level. Estimated standard errors are shown in parentheses.

Inspection of the model coefficients suggests that increases in number of marlin caught per trip has a significantly greater impact on trip price than increases in service levels. The implicit price of a one unit increase in marlin catch rates was estimated to be \$23.16 ($\partial P/\partial MC$). This is the amount that patrons are willing to pay for a one marlin per trip increase in catch rates. Alternatively stated, this amount is the implicit value to patron of increasing marlin catch rates per trip from 0.31 (the current industry average) to 1.31. By nature of the linear model, the implicit price is constant for all levels of marlin catch.

7.2 Contingent Ranking Analysis and Results

Charter boat patrons may differ appreciably with respect to the relative importance assigned to various attributes offered by charter boats. For example, one customer may prefer to pay a relatively low charter fee with no provision of special vessel comfort features, while a different customer may be willing to pay a higher price for added luxury. A statistical method called contingent ranking was used to determine how patrons value charter boat attributes, and to examine trade-offs that patrons are willing to make among attributes.

The contingent ranking method proceeded in four steps beginning with the identification of attributes that are relevant to patrons in their selection of a charter boat. The second step was to construct a set of written "stimuli" describing the levels of attributes possessed by alternative hypothetical charter boats. The third step was to present the stimuli to individual respondents for rank ordering according to their overall preferences. The final step was to use the preference data to estimate trade-off values and relative importance weights for selected boat attributes.

The charter boat attributes included in the contingent ranking should be relevant to patrons in terms of being influential in the boat selection process. The choice of relevant attributes was guided by the results of the Kewalo Basin pilot survey. In view of the finding that patrons are most interested in catching marlin and mahimahi, it is likely that patrons would evaluate a boat's fishing success in terms of past catch rates of these two types of fish. For the purposes of the contingent ranking, catch rate was described as the number of marlin and mahimahi caught by a boat during the past five fishing days. It is reasonable to assume that the skill of the captain and performance of the mate are highly correlated with fishing success and therefore need not be included in the analysis as separate attributes.

The difficulty of deriving a satisfactory objective measurement of the friendliness of the boat crew toward the patrons made it necessary to exclude this attribute from the analysis. Boat safety, also, was not included in the analysis due to the difficulty in defining customers' perceptions of safety in terms of objective physical measures. Comfort features of the boat would include such items as air-conditioning and the provision of food and beverages. Price was included as the fee for a full-day charter trip provided on a share basis.

In developing the stimulus set, a "full-profile" approach was used whereby all of the attributes were represented in each of the stimuli. In an effort to make the stimuli believable and thereby maintain the validity of the respondents' preference judgements, the attribute levels corresponded closely to a real marketplace situation. The stimuli were constructed using combinations of the following levels of attributes: 1) number of

marlin caught by boat during past five fishing days: none, one 225-pound marlin, two 225-pound marlin; 2) number of mahimahi caught by boat during past five fishing days: none, fifteen 13-pound mahimahi, thirty 13-pound mahimahi; 3) cost of the full-day trip per person: $50, $85, $110; , and 4) special comfort features available aboard the boat: yes, no. In order to limit the number of stimuli, a fractional factorial design was developed, resulting in nine attribute combinations.

Presentation of the stimulus set to survey subjects proceeded as follows. In the fishing valuation questionnaire, respondents were presented with written descriptions of nine alternative charter boats. For each alternative the level of marlin catch, mahimahi catch, comfort features and price was clearly enumerated. It was emphasized that the boats differed only with respect to these four attributes. Respondents were asked to rank the set of alternatives in terms of overall preference by placing the number "1" by their first choice, "2" by their second choice and so on from 1 to 9. The stimulus set provided to respondents is reproduced in Table 7.2.

The rankings provided data to estimate a main-effects, additive model to predict respondents' preferences. Huber(1975) notes that the inherent flexibility of this model renders it appropriate for approximating consumer responses where the underlying preference mappings are unknown, or are expected to vary across individuals.

Ordinary least squares regression was used to estimate the importance weights of the individual attributes. The regression model was as follows:

$$R_j = \sum_{k=1}^{4} w_k x_{kj} \qquad (7.2)$$

where R_j is the preference ranking for the jth stimulus (j=1,...9), w_k is the importance weight of the kth attribute (k=1,...,4) and x_{kj} is the level of the kth attribute for the jth stimulus. Parameters in Equation 7.2 were estimated for each respondent based on individual rankings, and for the sample group (N=229) as a whole using pooled rankings. The estimated equation for the aggregate data was:

$$R = 6.084 - 0.025P + 1.637MR + 0.289C + 0.092MA \qquad (7.3)$$

where P is price per trip, MR is marlin catch rate, C is vessel comfort features and MA is mahimahi catch rate. The ability to predict patrons' aggregate rankings using the estimated Equation 7.3 was tested using Spearman's rank-order correlation coefficient. This statistic measures the correlation between actual and predicted rankings. For the aggregate model, the Spearman's coefficient was 0.80 which was significant at the 0.01 level. Spearman's coefficient was also calculated for each individual's preference model. For 83% of the respondents, the Spearman's coefficient was significant at the 0.01 level.

Table 7.2 Contingent Ranking Stimulus Set Provided to Patrons

YOUR RANKING	COST OF THE FULL-DAY TRIP PER PERSON	TOTAL NUMBER OF PACIFIC MARLIN CAUGHT BY BOAT DURING PAST FIVE FISHING DAYS*	SPECIAL COMFORT FEATURES ARE AVAILABLE ABOARD THE BOAT: AIR CONDITIONING, SNACKS AND BEVERAGES	TOTAL NUMBER OF MAHI (DOLPHIN FISH) CAUGHT BY BOAT DURING PAST FIVE FISHING DAYS*
_____ BOAT A	$50	none	no	none
_____ BOAT B	$50	one 225-lb Marlin	no	thirty 13-lb Mahi
_____ BOAT C	$50	two 225-lb Marlin	no	fifteen 13-lb Mahi
_____ BOAT D	$85	none	no	fifteen 13-lb Mahi
_____ BOAT E	$85	one 225-lb Marlin	yes	none
_____ BOAT F	$85	two 225-lb Marlin	no	thirty 13-lb Mahi
_____ BOAT G	$110	none	yes	thirty 13-lb Mahi
_____ BOAT H	$110	one 225-lb Marlin	yes	fifteen 13-lb Mahi
_____ BOAT I	$110	two 225-lb Marlin	yes	none

*THESE ARE PAST CATCH RATES. YOUR CATCH ON ANY PARTICULAR BOAT MAY BE MORE OR MAY BE LESS.

To determine the relative importance that a typical patron assigns to the four attributes, the estimated weights in Equation 7.3 were standardized and normalized such that the vector summed to unity. The relative importance weights were (in order of magnitude) 0.51 for marlin catch, 0.37 for mahimahi catch, 0.11 for price, and 0.01 for comfort features.

Parameter estimates from the regression analyses provided infomation about potential trade-offs that patrons make among attributes. The trade-off between a quality attribute and price indicates the amount patrons are willing to pay for increments of that attribute, keeping utility and the levels of all other attributes constant. Trade-off values were calculated as the ratio of parameter estimates given in Equation 7.3. It was found that a typical patron would pay an additional $65 (1.637/0.025) per trip for a boat that had a marlin catch rate 65% higher than the seasonally-adjusted average marlin catch rate for Kewalo Basin boats of 0.31 marlin per trip. Patrons were less willing to pay higher prices for increased mahimahi catches. Estimated trade-off values suggest that a typical patron would pay roughly an additional $4 (0.092/0.025) per trip for a boat with a catch rate approximately 420% higher than the seasonally-adjusted average mahimahi catch rate for Kewalo Basin boats of 0.71 mahimahi per trip. Finally, it was estimated that an average respondent would be willing to pay about $12 extra per trip for the presence of special comfort features aboard a charter boat.

CONCLUSIONS

8.1 Scope of Study and Limitations

The goal of this study is to explain the demographic characteristics, attitudes, motives and fishing values of Hawaii's charter boat patrons. The procedure for accomplishing this goal was to examine in detail the characteristics of patrons departing from charter boats at Kewalo Basin, on the island of Oahu. The ability to generalize the survey results reported here to the rest of Hawaii's charter patron population depends on the strength of locational and temporal sampling biases. It is possible that the sample selected at Kewalo Basin is not indicative of patrons taking charter trips at other ports around Hawaii. However, comparisons made between the results of this study and those reported for the Kailua-Kona charter fishery (NMFS, 1983a) suggest that the charter patron population is relative homogeneous around the state. Perhaps a more serious problem is the fact that the sampling time frame was restricted to March through August of 1984. Hence, winter visitors are not represented in the sample. Also not included in the sample are ex-patrons who used to go charter fishing in Hawaii but have since stopped, perhaps due to perceived quality deterioration. Similarly, the sample does not represent patrons who are potential users of charter boat services but have not yet expressed this demand. Both groups may have different characteristics and preferences compared to current users.

The economic valuation techniques used in the study were state-of-the-art. It is important to recognize that this area of empirical inquiry is still evolving. Aside from internal comparisons between valuation estimates, no attempt was made to externally validate fishing values obtained here.

8.2 Implications for Fisheries Management

Catching fish is valuable to the charter fishing industry both in terms of direct sales value and attraction to patrons. This study has examined the importance of fish catch from the point of view of patrons. Evidence presented here suggests that marginal changes in fish catch rates will likely not significantly affect aggregate demand for charter trips. This conclusion is supported by :1) CVM demand analysis which showed that fish catch on the intercepted trip was not a significant variable explaining willingness to take trips at alternative prices; 2) the low percent of repeat customers; 3) the relatively limited charter fishing experience level of patrons; 4) the high satisfaction levels with the charter fishing expenditure even though patrons typically did not catch a fish, and 5) patrons' willingness to take trips even if the likelihood of catching a fish is low. Thus, if marlin catch rates were to drop (or increase) by say 10%, total trips taken per year per capita and in aggregate would

tend to remain constant, all other things being equal.

Although demand for trips may not be sensitive to fish catch, the value that patrons derive from individual trips may diminish if fish catch rates, particularly for billfish, were to decline. This conclusion is evidenced by the results of the hedonic price analysis and the contingent ranking approach which both show a high imputed value of changes in marlin catch rates. Thus, if marlin catch rates increased by 10%, charter patrons would typically be more satisfied compared to before the catch rate increase occurred.

8.3 Implications for Charter Fishing Marketing Efforts

Although this study did not seek to fully investigate the market for charter boat services, several marketing issues have been raised. First, it is clear that most patrons are visitors, many from Canada. For the large majority of these patrons charter fishing is only one of a number of reasons for visiting Hawaii. Charter boats therefore must compete with many other tourist activities in attracting customers. This implies a need to inform a broad visitor audience about charter fishing opportunities and encourage them to take charter trips. Perhaps an organized industry-wide effort could perform this promotional effort most efficiently.

Most patrons appear to make vessel selection decisions after visiting the boat harbor. An attractive and safe dock area will encourage more potential patrons to investigate the charter fishing market. Individual boats can enhance their images by maintaining attractive sales booths and berthing areas.

Patrons for the most part do not appear to be familiar with the various types of game fish occurring in Hawaiian waters, with the exception of billfish. Promotion of other more abundant fish types (including shark) could increase patron demand and satisfaction.

In promoting their services, charter boat owners should stress vessel comfort and crew quality. Although other attributes may generally be viewed as more important by patrons, vessel comfort and crew quality appear to be more determinant in the boat selection process. To develop the Hawaii resident charter patron market, boats may want to adopt a fish-keeping policy whereby the catch is shared between the boat and patron. Finally, boats may wish to experiment with a higher price structure. Patron average willingness to pay exceeds current prices charged for charter services. In addition, a discriminatory pricing system that gives a discount rate to residents could likely increase industry revenues.

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APPENDIX A

SURVEY QUESTIONNAIRES

Resident Expenditure Survey
Visitor Expenditure Survey
Valuation Survey
Dockside Survey

RESIDENT EXPENDITURE SURVEY

ID 3 _ _ _

SPECIAL

HAWAII CHARTER FISHING SURVEY

THANK YOU FOR VOLUNTEERING TO HELP US OUT WITH THE SPECIAL HAWAII CHARTER FISHING SURVEY. THIS RESEARCH IS SPONSORED BY THE UNIVERSITY OF HAWAII AND THE NATIONAL MARINE FISHERIES SERVICE. SURVEY RESULTS WILL BE USED BY THE HAWAII CHARTER FISHING INDUSTRY AND HAWAII GOVERNMENT TO BETTER MANAGE AND PROTECT OUR SPORT FISHERY RESOURCES. YOUR ASSISTANCE IS ESSENTIAL TO THE SUCCESS OF THIS SURVEY.

IF YOU HAVE ANY QUESTIONS ABOUT OUR RESEARCH OBJECTIVES, OR ABOUT THIS QUESTIONNAIRE, PLEASE DO NOT HESITATE TO CONTACT:

Dr. Karl C. Samples
Department of Agriculture and Resource Economics
University of Hawaii
Honolulu, Hawaii 96822
(808)948-8360

1 How many family members or acquaintances accompanied you on your deep sea fishing trip today?

_____ People

2 We'd like to get an idea of the expenditures made by all the people in your immediate fishing party for the deep sea fishing trip you took today.

The following is a list of expense items. Please indicate the amount of money you, along with other people in your immediate fishing party, spent on each item for the fishing trip you took today. Don't forget to include all amounts spent in the form of cash, check, or credit card. If no expenditures were made for a particular item, place a "0" in blank.

TYPE OF EXPENDITURE	TOTAL SPENT BY MYSELF AND OTHERS IN MY FISHING PARTY
Charter fees	$ _____
Transportation from home to boat	$ _____
Transportation from boat back to home	$ _____
Food and beverage intended for consumption on fishing trip	$ _____
Special fishing tackle	$ _____
Special clothing, such as pants, shoes, gloves, etc.	$ _____
Sundry items, such as suntan lotion, seasick pills, or photo supplies	$ _____
Fish taxidermy	$ _____
Tips to boat captain and crew	$ _____
Other fishing-related expenses (SPECIFY)	
_____	$ _____

3 Did your fishing trip today require an overnight stay away from your home?

_____ No

_____ Yes

What were/will be your total expenses for lodging? $_____

What were/will be your total expenses for food? $_____

IN THIS SECTION WE WOULD LIKE TO ASK YOU SOME QUESTIONS ABOUT YOUR BACKGROUND WHICH WILL HELP US COMPARE YOUR ANSWERS TO THOSE OF OTHER PEOPLE. WE WOULD STRESS THAT ALL OF YOUR ANSWERS ARE STRICTLY CONFIDENTIAL.

4 How old are you? _____ years old

5 Are you _____ male _____ female?

6 How many years of school have you completed?

___1___2___3___4___5___6___7___8___9___10___11___12

___some college ___B.A. or equivalent ___M.A. or equivalent

___Advanced degree (M.D., Ph.D., etc.)

7 What is your primary occupation? Please be specific as possible. If you are a homemaker or student, please indicate the occupation of your spouse or parent. If retired, give your former occupation.

_____

8 With reference to your primary occupation, are you currently:

_____ fully retired

_____ semi-retired, working part-time

_____ retired, working at a different job part-time

_____ none of the above

9 Please check the response that comes closest to your total family income before taxes. If you are a student, and unmarried, please give your parents' income.

_____ $0 to $3,999
_____ $4,000 to $7,999
_____ $8,000 to $11,999
_____ $12,000 to $15,999
_____ $16,000 to $19,999
_____ $20,000 to $23,999
_____ $24,000 to $27,999
_____ $28,000 to $31,999
_____ $32,000 to $35,999
_____ $36,000 to $39,999
_____ $40,000 to $43,999
_____ $44,000 to $47,999
_____ more than $48,000

If you have any comments about this questionnaire, or the research project, please state them here!

_____

_____

_____

THANK YOU FOR YOUR ASSISTANCE. WE HOPE THAT YOU FOUND THIS QUESTIONNAIRE AN INTERESTING AND ENJOYABLE EXPERIENCE!

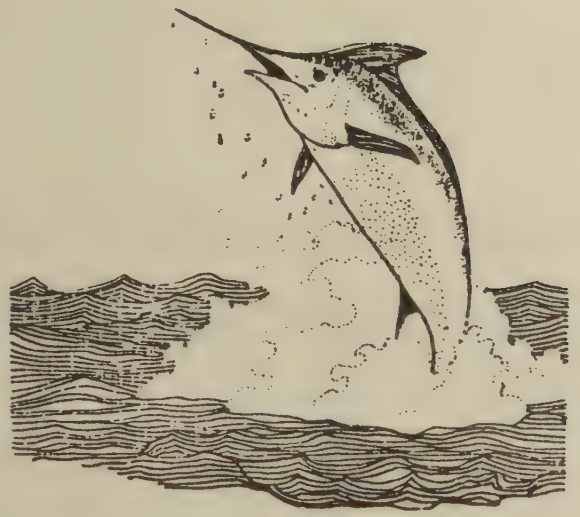
PLEASE RETURN THE QUESTIONNAIRE AT YOUR EARLIEST CONVENIENCE IN THE PROVIDED SELF-ADDRESSED, STAMPED ENVELOPE.

VISITOR EXPENDITURE SURVEY

ID 1 _ _ _

SPECIAL

HAWAII CHARTER FISHING SURVEY



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THANK YOU FOR VOLUNTEERING TO HELP US OUT WITH THE SPECIAL HAWAII CHARTER FISHING SURVEY. THIS RESEARCH IS SPONSORED BY THE UNIVERSITY OF HAWAII AND THE NATIONAL MARINE FISHERIES SERVICE. SURVEY RESULTS WILL BE USED BY THE HAWAII CHARTER FISHING INDUSTRY AND HAWAII GOVERNMENT TO BETTER MANAGE AND PROTECT OUR SPORT FISHERY RESOURCES. YOUR ASSISTANCE IS ESSENTIAL TO THE SUCCESS OF THIS SURVEY.

IF YOU HAVE ANY QUESTIONS ABOUT OUR RESEARCH OBJECTIVES, OR ABOUT THIS QUESTIONNAIRE, PLEASE DO NOT HESITATE TO CONTACT:

Dr. Karl C. Samples
Department of Agriculture and Resource Economics
University of Hawaii
Honolulu, Hawaii 96822
(808)948-8360

1 What is your state or country of residence?

_____

2 When did you first consider going deep sea fishing in the State of Hawaii?

_____ Before leaving the mainland or your country of residence

_____ After arrival in Hawaii

3 If you considered going deep sea fishing before your arrival in Hawaii, we'd like you to assign a percentage to the importance of deep sea fishing in your decision to travel to Hawaii. You should assign a very high percentage importance, for example, if you came strictly to go deep sea fishing. You should assign a low percentage importance if deep sea fishing was only incidental to your visit. What percentage importance did deep sea fishing have on:

Your decision to visit the State of Hawaii ____% Importance

4 On your deep sea fishing trip today, how many people, including yourself, belonged to your immediate travel party?

_____ People

5 Was there anyone in your immediate travel party who did not go fishing on this trip with you?

_____ YES How many? _____

_____ NO

6 Have you already gone on other deep sea fishing trips during this visit to the State of Hawaii?

_____ YES How many full-day trips taken? _____

_____ NO How many half-day trips taken? _____

7 Do you plan to go deep sea fishing again during this visit?

_____ YES How many full-day trips planned? _____

_____ NO How many half-day trips planned? _____

8 How many days and nights in total are you spending in the State of Hawaii during your current visit?

_____ Days

_____ Nights

9 We'd like to get an idea of the expenditures made by all the people in your immediate travel party for the deep sea fishing trip you took today.

The following is a list of expense items. Please indicate the amount of money you, along with other people in your immediate travel party, spent on each item for the fishing trip you took today. Don't forget to include all amounts spent in the form of cash, check, or credit card. If no expenditures were made for a particular item, place a "0" in blank.

If an expense item was included in a tour package plan, do not fill in dollar amounts but please check appropriate box.

TYPE OF EXPENDITURE	TOTAL SPENT BY MYSELF AND OTHERS IN MY TRAVEL PARTY
Charter fees	$ _____
Charter fees included in package [ ]	
Transportation from lodging to boat	$ _____
Transportation from boat back to lodging	$ _____
Transportation included in package [ ]	
Food and beverage intended for consumption on fishing trip	$ _____
Special fishing tackle	$ _____

gloves, etc. $ _____

Sundry items, such as suntan lotion, seasick pills, or photo supplies $ _____

Fish taxidermy $ _____

Tips to boat captain and crew $ _____

Other fishing-related expenses (SPECIFY)

_____ $ _____

10 Were you in the State of Hawaii all of yesterday?

_____ Yes, I was in the State of Hawaii all of yesterday

_____ No, I was not in the State of Hawaii all of yesterday

If no, go on directly to Question 11.

We are trying to get an idea of how much money in the form of cash, check, or credit card was spent all of yesterday in State of Hawaii by everyone in your immediate travel party. The following is a list of expense items. Please indicate the amount of money you and other people in your immediate travel party spent in total for each expense item. If no expenditures were made for a particular item, place a "0" in blank.

If an expense item was included in a tour package plan, do not fill in dollar amount but please check appropriate box.

TYPE OF EXPENDITURE	TOTAL SPENT IN THE STATE OF HAWAII YESTERDAY BY MYSELF AND OTHERS IN MY IMMEDIATE TRAVEL PARTY
Food and beverages, including tips	
Breakfast	$ _____
Lunch	$ _____
Dinner	$ _____
Snacks	$ _____
Food and beverages included in package [ ]	

Lodging (SPECIFY TYPE)

_____ Hotel/Motel _____ Friend or relative

_____ Condominium _____ Other $ _____

Lodging included in package [ ]

Entertainment and sightseeing tours $ _____

Entertainment and sightseeing tours included in package [ ]

Car rental, including gas (SPECIFY NUMBER OF DAYS RENTED)

_____ days $ _____

Transportation included in package [ ]

Inter-island airfare $ _____

Inter-island airfare included in package [ ]

Other transportation, such as taxi, bus, and parking $ _____

Tips to airport and/or hotel personnel $ _____

Gifts, souvenirs $ _____

Clothing $ _____

Sundry items, such as film, suntan lotion, health and beauty aids $ _____

Any other expenditures (SPECIFY)

_____

_____ $ _____

11 How much was spent altogether for airfare for your travel party's round trip tickets to and from the State of Hawaii?

$ _____

Airfare included in package [ ]

12 (TO BE ANSWERED ONLY BY RESPONDENTS ON TOUR PACKAGE PLAN).

What was the total price of your travel party's tour package plan to Hawaii?

$ _____

IN THIS SECTION WE WOULD LIKE TO ASK YOU SOME QUESTIONS ABOUT YOUR BACKGROUND WHICH WILL HELP US COMPARE YOUR ANSWERS TO THOSE OF OTHER PEOPLE. WE WOULD STRESS THAT ALL OF YOUR ANSWERS ARE STRICTLY CONFIDENTIAL.

13 How old are you? _____ years old

14 Are you _____ male _____ female?

15 How many years of school have you completed?

__1__2__3__4__5__6__7__8__9__10__11__12

___some college ___B.A. or equivalent ___M.A. or equivalent

___Advanced degree (M.D., Ph.D., etc.)

16 What is your primary occupation? Please be specific as possible. If you are a homemaker or student, please indicate the occupation of your spouse or parent. If retired, give your former occupation.

_____

17 With reference to your primary occupation, are you currently:

_____ fully retired

_____ semi-retired, working part-time

_____ retired, working at a different job part-time

_____ none of the above

18 Please check the response that comes closest to your total family income before taxes. If you are a student and unmarried, please give your parents' income.

_____ $0 to $3,999

_____ $4,000 to $7,999

_____ $8,000 to $11,999

_____ $12,000 to $15,999

_____ $16,000 to $19,999

_____ $20,000 to $23,999

_____ $24,000 to $27,999

_____ $28,000 to $31,999

_____ $32,000 to $35,999

_____ $36,000 to $39,999

_____ $40,000 to $43,999

_____ $44,000 to $47,999

_____ more than $48,000

If you have any comments about this questionnaire, or the research project, please state them here!

_____

_____

_____

THANK YOU FOR YOUR ASSISTANCE. WE HOPE THAT YOU FOUND THIS QUESTIONNAIRE AN INTERESTING AND ENJOYABLE EXPERIENCE!

PLEASE RETURN THE QUESTIONNAIRE AT YOUR EARLIEST CONVENIENCE IN THE PROVIDED SELF-ADDRESSED, STAMPED ENVELOPE.

VALUATION SURVEY

ID 4___

SPECIAL

HAWAII CHARTER FISHING SURVEY

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THANK YOU FOR VOLUNTEERING TO HELP US OUT WITH THE SPECIAL HAWAII CHARTER FISHING SURVEY. THIS RESEARCH IS SPONSORED BY THE UNIVERSITY OF HAWAII AND THE NATIONAL MARINE FISHERIES SERVICE. SURVEY RESULTS WILL BE USED BY THE HAWAII CHARTER FISHING INDUSTRY AND HAWAII GOVERNMENT TO BETTER MANAGE OUR FISHERY RESOURCES. IF YOU HAVE ANY QUESTIONS ABOUT OUR RESEARCH OBJECTIVES, OR ABOUT THIS QUESTIONNAIRE, PLEASE DO NOT HESITATE TO CONTACT:

Dr. Karl C. Samples
Department of Agriculture and Resource Economics
University of Hawaii
Honolulu, Hawaii 96822
(808) 948-8360

THANKS AGAIN FOR YOUR HELP!

IN THIS SECTION WE ARE INTERESTED IN LEARNING MORE ABOUT YOUR VIEWS AND OPINIONS CONCERNING CHARTER BOAT FISHING IN HAWAII.

How many charter fishing trips have you taken during the past five years (including the trip you just took) in Hawaii and other locations? (FILL IN THE BLANKS WITH THE CORRECT NUMBER)

_____Charter trips taken <u>in Hawaii</u> during the past five years.

_____Charter trips taken <u>outside of Hawaii</u> during the past five years.

We are interested in learning what factors motivated you to go charter fishing in Hawaii. A list of possible factors is given below. For each, please indicate its importance in motivating you to go charter fishing in Hawaii. (CIRCLE THE LEVEL OF IMPORTANCE FOR EACH FACTOR)

MOTIVATING FACTOR	NOT AT ALL IMPORTANT	MODERATELY IMPORTANT	VERY IMPORTANT
To have fun	NI	MI	VI
To escape the daily routine and relieve tensions	NI	MI	VI
To seek adventure	NI	MI	VI
To be with other people with similar interests	NI	MI	VI
To learn about nature	NI	MI	VI
To fight a fish	NI	MI	VI
To be on the ocean	NI	MI	VI
To experience a fishing challenge	NI	MI	VI
To have a convenient way to go deep sea fishing	NI	MI	VI
To be able to eat fish	NI	MI	VI
To develop fishing skills	NI	MI	VI

MOTIVATING FACTOR	NOT AT ALL IMPORTANT	MODERATELY IMPORTANT	VERY IMPORTANT
To establish/maintain business contacts	NI	MI	VI
To demonstrate fishing skills to others	NI	MI	VI
To share a recreational experience with friends and family	NI	MI	VI
To catch a fish to be mounted	NI	MI	VI

3 Assuming you were in Hawaii next year, what are the chances you would take another charter fishing trip. On a scale of 0(low) to 10(high), rate the chances that you would take another fishing trip next year, <u>if you were in Hawaii</u>. If you would definitely take a trip, circle "10". If you are absolutely sure you would <u>not</u> take a trip, circle "0". (CIRCLE ONE NUMBER)

0 1 2 3 4 5 6 7 8 9 10

4 Assuming you lived in Hawaii all year round, how many full-day charter fishing trips would you take each year if the price of a trip <u>per person</u> was $_____? If you already live in Hawaii, tell us how many full-day charter fishing trips you would take next year at a price of $_____ per person. (CHOOSE ONE)

_____ 1 trip per year
_____ 2 trips per year
_____ 3 trips per year
_____ 4 trips per year
_____ 5 trips per year
_____ 6 trips per year
_____ 7 trips per year
_____ 8 trips per year
_____ 9 trips per year
_____ 10 trips per year
_____ 11 trips per year
_____ 12 trips per year
_____ over 12 trips

5 How important to you is catching a marlin while deep sea charter fishing in Hawaii? (CHOOSE ONE)

_____ If I knew that I would'nt catch a marlin, I <u>definitely</u> wouldn't take a charter fishing trip in Hawaii.

_____ If I knew that I wouldn't catch a marlin, I <u>probably</u> wouldn't take a charter fishing trip in Hawaii.

_____ If I knew I wouldn't catch a marlin, I would <u>definitely</u> still take a charter trip due to other motivating factors.

6 How do you personally feel about each of the statements below? (CIRCLE THE RESPONSE THAT IS CLOSEST TO THE WAY YOU FEEL)

DD - Definitely Disagree
pd - probably disagree
DA - Definitely Agree
pa - probably agree
NA - Not Applicable To Me

Even if I don't catch any fish, I still enjoy the charter fishing experience.	DD	pd	pa	DA	NA
I would prefer to catch one 400 lb. marlin rather than two 200 lb. marlins.	DD	pd	pa	DA	NA
There are too many other boats at good fishing locations to make fishing enjoyable	DD	pd	pa	DA	NA
If required, I would be willing to pay $20 for an annual Hawaii deep sea fishing license.	DD	pd	pa	DA	NA
I would charter the same boat I used today for my next deep sea charter trip.	DD	pd	pa	DA	NA

7 If for some reason deep sea charter fishing was no longer available in Hawaii, what substitute activities would you participate in? (CHECK ALL SUBSTITUTE ACTIVITIES THAT YOU WOULD SERIOUSLY CONSIDER)

_____ Fish from shore

_____ Take a trip on a cruise boat for a few hours

_____ Play tennis, golf or other sports away from the ocean

_____ Spend more time at the beach

_____ Take a tour at some inland location

_____ None of the above

8 What source(s) of information prompted you to go charter fishing in Hawaii? (CHECK ALL ANSWERS THAT ARE TRUE FOR YOU)

_____ Magazine or newspaper ads or articles

_____ Hotel tour desk

_____ Television program or movie

_____ Tour package plan

_____ Personal visit to boat docking area

_____ Suggestion of friends

_____ Previous experience fishing in Hawaii

_____ Other (Please specify)_____

9 We are interested in learning what sources of information were important to you in selecting a particular boat for your charter fishing trip. A list of information sources is given below. For each, please indicate its importance in assisting you in your selection of a boat (CIRCLE THE LEVEL OF IMPORTANCE FOR EACH INFORMATION SOURCE)

SOURCE OF INFORMATION	NOT AT ALL IMPORTANT	MODERATELY IMPORTANT	VERY IMPORTANT
Recommendation of friends	NI	MI	VI
Personal visit to boat harbor prior to taking trip	NI	MI	VI
Hotel tour desk	NI	MI	VI
Magazine or newspaper advertisement	NI	MI	VI
Tour package plan	NI	MI	VI
Yellow pages	NI	MI	VI
Previous experience fishing with captain and/or boat	NI	MI	VI

10 How many different charter boats did you seriously consider before selecting a particular boat? (CHOOSE ONE)

___ one ___ four
___ two ___ five
___ three ___ more than five

11 Based on the information available to you, how much difference do you feel there is among charter boats in Hawaii with respect to the following characteristics? (CIRCLE THE LEVEL OF DIFFERENCE FOR EACH FACTOR)

CHARACTERISTIC	NO DIFFERENCE	MODERATE DIFFERENCE	LARGE DIFFERENCE
Quantity of fish caught	ND	MD	LD
Type of fish caught	ND	MD	LD
Price of trip	ND	MD	LD
Comfort features of boat	ND	MD	LD
Service of captain and crew	ND	MD	LD

12 Are you generally satisfied with the quantity and quality of information available for making comparisons among charter boats in Hawaii? (CHOOSE TWO)

QUANTITY OF INFORMATION	QUALITY OF INFORMATION
_____Satisfactory	_____Satisfactory
_____Not satisfactory	_____Not satisfactory

13 Given the amount and type of fish you caught on your most recent charter fishing trip in Hawaii, do you intend to go charter fishing in Hawaii again within the next ten years? (CHOOSE ONE)

_____ Yes

_____ No

_____ I do not plan to be back in Hawaii within 10 years

14 On a scale of 1(low) to 10(high), how would you rate deep sea charter fishing in Hawaii compared to charter boat fishing in other places you may have visited or have heard about? You should give it a high rating if fishing in Hawaii compares favorably with other places and a low rating if it compares unfavorably. (CIRCLE ONE NUMBER)

1 2 3 4 5 6 7 8 9 10

_____ I have no basis for making a good comparison.

15 If for some reason deep sea charter boat fishing was not available in Hawaii would you have still have visited Hawaii? (CHOOSE ONE)

_____ Yes

_____ No

_____ I am a resident of Hawaii.

THE NEXT SERIES OF QUESTIONS HAS ABSOLUTELY NO CONNECTION WITH CURRENT OR FUTURE PLANS FOR FISHERIES MANAGEMENT IN HAWAII. WE ARE ONLY INTERESTED IN FINDING OUT HOW MUCH AN ACTIVITY SUCH AS DEEP SEA FISHING IN HAWAII IS ACTUALLY WORTH. IN THE SET OF QUESTIONS BELOW, WE ASK YOU TO PUT YOURSELF IN SOME HYPOTHETICAL SITUATIONS. NONE OF THESE SITUATIONS ARE REAL, BUT WE HOPE YOU WILL ANSWER AS IF THEY WERE REAL SITUATIONS.

6 Suppose that you were planning a charter fishing trip in Hawaii and were offered a choice between: (1) receiving a cash gift of $_____, or (2) having an absolute guarantee of landing an average size (225 lbs.) Pacific marlin during your upcoming charter fishing trip. It is up to you to choose whether to accept the cash gift, or have the guarantee of catching a marlin. Which option would you choose? (CHOOSE ONE)

_____ I'd select the cash gift

_____ I'd select the guarantee of landing a marlin

7 Suppose that a daily saltwater fishing license was required to go deep sea charter fishing in Hawaii. Without a license you would not be able to go charter fishing. Suppose that the cost of the daily fishing license was set at $_____. This fee would simply be added to the cost of a charter fishing trip. Would you be willing to pay this annual fee to be able to go charter fishing in Hawaii for a day? (CHOOSE ONE)

_____ Yes

_____ No

8 Suppose that you were heading to the docks to take a full-day charter fishing trip in Hawaii and someone offered you $_____ not to go charter fishing that day. If you accepted the cash offer you would have to cancel your planned fishing trip. All deposits you may have made would be refunded and there would be no financial loss to you due to your cancellation. You would still be able to fish from shore, or engage in other marine-related activities. Would you accept the cash offer and not go charter fishing for a day? (CHOOSE ONE)

_____ Yes

_____ No

19 Suppose instead of offering a specific cash offer of $_____ we let you set your own payment terms. What is the least amount you would accept as a cash payment to cancel a planned charter fishing trip? (INSERT DOLLAR AMOUNT IN SPACE BELOW)

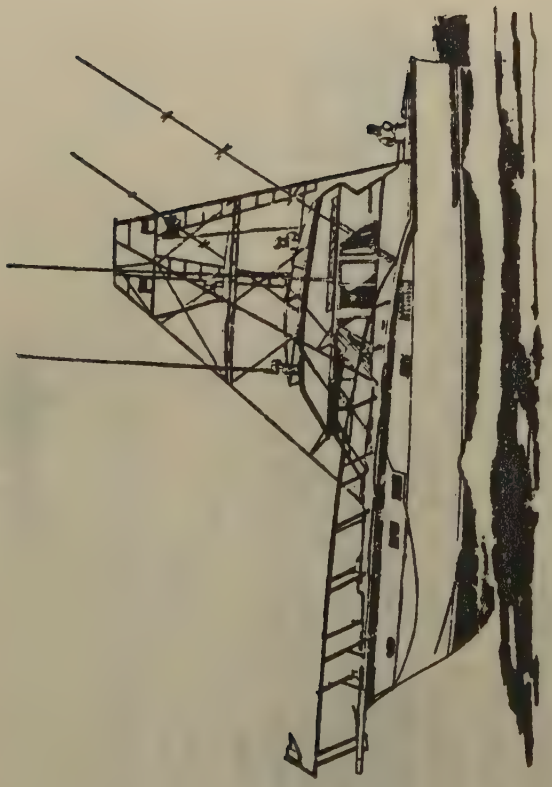
$_____ is the smallest acceptable cash payment

20 What is the absolute highest price (per person) that you would be willing to pay to take a full-day charter fishing trip in Hawaii? You would be required to pay this price everytime you went charter fishing. (PUT DOLLAR AMOUNT IN SPACE BELOW)

$_____ per person is the highest price I would be willing to pay to go charter fishing in Hawaii for a full-day.

YOUR RANKING	$ COST OF THE FULL-DAY TRIP PER PERSON	TOTAL NUMBER OF PACIFIC MARLIN CAUGHT BY BOAT DURING PAST FIVE FISHING DAYS*	SPECIAL COMFORT FEATURES ARE AVAILABLE ABOARD THE BOAT: AIR CONDITIONING, SNACKS AND BEVERAGES	TOTAL NUMBER OF MAHI (DOLPHIN FISH) CAUGHT BY BOAT DURING PAST FIVE FISHING DAYS*
_____ BOAT A	$50	none	no	none
_____ BOAT B	$50	one 225-lb Marlin	no	thirty 13-lb Mahi
_____ BOAT C	$50	two 225-lb Marlin	no	fifteen 13-lb Mahi
_____ BOAT D	$85	none	no	fifteen 13-lb Mahi
_____ BOAT E	$85	one 225-lb Marlin	yes	none
_____ BOAT F	$85	two 225-lb Marlin	no	thirty 13-lb Mahi
_____ BOAT G	$110	none	yes	thirty 13-lb Mahi
_____ BOAT H	$110	one 225-lb Marlin	yes	fifteen 13-lb Mahi
_____ BOAT I	$110	two 225-lb Marlin	yes	none

*THESE ARE PAST CATCH RATES. YOUR CATCH ON ANY PARTICULAR BOAT MAY BE MORE OR MAY BE LESS.



IMPORTANT IMPORTANT

21 PEOPLE HAVE DIFFERENT DESIRES AND PRIORITIES WHEN THEY SELECT A DEEP SEA CHARTER FISHING BOAT. WE ARE VERY INTERESTED IN LEARNING WHAT FEATURES OF A BOAT ARE MOST IMPORTANT TO YOU.

ON THE OPPOSITE PAGE ARE DESCRIPTIONS OF 9 HYPOTHETICAL CHARTER FISHING BOATS. WE WOULD VERY MUCH APPRECIATE IT IF YOU WOULD RANK THESE BOATS IN ORDER OF YOUR PREFERENCE.

ALL BOATS ARE MODERN 45-FOOT CABIN CRUISERS LIKE THE ONE SHOWN ABOVE. ALL ARE SAFETY INSPECTED BY THE COAST GUARD.

THERE ARE DIFFERENCES, HOWEVER, AMONG THE BOATS WITH RESPECT TO PRICE, CATCH AND COMFORT FEATURES. FOR EXAMPLE, BOAT C CHARGES $50 PER PERSON. LAST WEEK BOAT C CAUGHT 2 MARLIN AND 15 MAHIMAHI. BOAT C HAS NO SPECIAL COMFORT FEATURES, AS SAY COMPARED TO BOAT I.

AFTER CAREFULLY READING THE ALTERNATIVES, WRITE THE NUMBER "1" IN THE SPACE BY YOUR FIRST CHOICE, WRITE THE NUMBER "2" BY YOUR SECOND CHOICE, AND SO ON FROM 1 TO 9.

YOUR CAREFUL RANKINGS ARE VERY IMPORTANT TO OUR STUDY.

IN THIS SECTION WE WOULD LIKE TO ASK YOU SOME QUESTIONS ABOUT YOUR BACKGROUND WHICH WILL HELP US COMPARE YOUR ANSWERS TO THOSE OF OTHER PEOPLE. WE WOULD STRESS THAT ALL OF YOUR ANSWERS ARE STRICTLY CONFIDENTIAL.

2 How old are you? _____ years old

3 Are you _____ Male _____Female?

4 How many years of school have you completed?

____1____2____3____4____5____6____7____8____9____10____11____12

____Some college ____B.A. or equivalent ____M.A. or equivalent

____Advanced degree (M.D., Ph.D., etc.)

5 What is your primary occupation? Please be specific as possible. If you are a homemaker or student, please indicate the occupation of your spouse or parent. If retired, give your former occupation.

_____

6 With reference to your primary occupation, are you currently:

_____ Fully retired

_____ Semi-retired, working part-time

_____ Retired, working at a different job part-time

_____ None of the above

7 Please check the response that comes closes to your total family income before taxes. If you are a student, and unmarried, please give your parents' income.

_____ $0 to $3,999

_____ $4,000 to $7,999

_____ $8,000 to $11,999

_____ $12,000 to $15,999

_____ $16,000 to $19,999

_____ $20,000 to $23,999

_____ $24,000 to $27,999

_____ $28,000 to $31,999

_____ $32,000 to $35,999

_____ $36,000 to $39,999

_____ $40,000 to $43,999

_____ $44,000 to $47,999

_____ more than $48,000

IF YOU HAVE ANY COMMENTS CONCERNING THIS QUESTIONNAIRE OR THE RESEARCH PROJECT PLEASE LIST THEM HERE.

_____

DOCKSIDE SURVEY

SPECIAL CHARTER FISHING SURVEY

Date: ☐☐☐☐☐☐ Port: _____ ☐☐

Time: ☐☐☐☐ Boat Name: _____ ☐☐☐☐

Interviewer: _____ ☐ Sea Conditions ___<4' (1) ___4-8'(2) ___8-12' (3) ___>12' (4)

The University of Hawaii is conducting a survey to learn more about the needs and attitudes of charter fishing customers in Hawaii. We would appreciate it if you would take a few minutes to answer a few questions.

1. May I ask where you're from?

_____Mainland U.S. (1) Hawaii _____Local Island (3)

_____Outside the U.S. (4) _____Other Island (2)

_____Refused (9)

The first part of the survey you can take with you and return it to us at your convenience in this self-addressed, stamped envelope. In return for your completed questionnaire, we will send you one of these free gifts (show choices).

_____Non-resident Expenditure (1) ID# 1☐☐☐

_____Other Island Expenditure (2) ID# 2☐☐☐

_____Local Island Expenditure (3) ID# 3☐☐☐

_____Fishing Value (4) ID# 4☐☐☐

_____Refused (9)

THE SECOND PART OF THE SURVEY CONSISTS OF A FEW BRIEF QUESTIONS.

2. How would you rate Hawaii deep sea charter fishing in terms of its importance to you as a vacation or leisure activity. Is charter fishing not important at all, moderately important or very important?

___Not important (1) ___Moderately Important (2)

___Very Important (3) ___Don't Know (8) ___Refused (9)

3A. Did you personally catch any fish during your fishing trip today?

___No (1) ___Yes (2) ___Refused (9)

3B. Type Number

_____ ☐☐

_____ ☐☐

_____ ☐☐

Code "98" if "Don't know"

4A. Did anyone else on your boat catch any fish during your fishing trip today?

___No (1) ___Don't know (8)

___Yes (2) ___Refused (9)

4B. Type Number

_____ ☐☐

_____ ☐☐

_____ ☐☐

_____ ☐☐

Code "98" if "Don't know"

5. Did you take a half-day or full-day fishing trip today?

___Half-day (1) ___Full-day (2) ___Refused (9)

6. May I ask you what you paid for your fishing trip today?

$_____per person $_____your share of private charter

___Don't know (888) ___Refused (999)

7. Did any family members accompany you on your fishing trip?

____No (1) END OF INTERVIEW ____ Refused (9)

____Yes (2) (Go to Question 8)

8. We would like to get an idea of the sex and approximate age of each of the family members.

Beginning with the first member, are they male or female? (record sex) Which category includes the age of this individual- just say the letter. (Show card)
(Repeat for all family members)

1) Sex: ____ Male (1) ____ Female (2) ____ Refused (9)

Age: ____A(1) ____B(2) ____C(3) ____D(4) ____E(5) ____ Refused (

2) Sex: ____ Male (1) ____ Female (2) ____ Refused (9)

Age: ____A(1) ____B(2) ____C(3) ____D(4) ____E(5) ____ Refused (

3) Sex: ____ Male (1) ____ Female (2) ____ Refused (9)

Age: ____A(1) ____B(2) ____C(3) ____D(4) ____E(5) ____ Refused (

4) Sex: ____ Male (1) ____ Female (2) ____ Refused (9)

Age: ____A(1) ____B(2) ____C(3) ____D(4) ____E(5) ____ Refused (

5) Sex: ____ Male (1) ____ Female (2) ____ Refused (9)

Age: ____A(1) ____B(2) ____C(3) ____D(4) ____E(5) ____ Refused (

6) Sex: ____ Male (1) ____ Female (2) ____ Refused (9)

Age: ____A(1) ____B(2) ____C(3) ____D(4) ____E(5) ____ Refused (

APPENDIX B

STATISTICAL OVERVIEW OF THE TAKE-IT-OR-LEAVE-IT APPROACH

Consider an experiment where the response is binary. Let the response 1 be interpreted as the occurrence of an event Z and the response 0 as the nonoccurrence of Z. For example in the charter boat license fee offers developed in this study, the response 1 would represent the willingness to pay the fee and response of 0 would represent rejection of the offer. In the logit model the occurrence of the event Z is assumed to follow a logistic probability density function:

$$P_i = \text{prob}(Z_i = 1) = 1/1+\exp(-Z_i) \qquad \text{(B.1)}$$

Note that P_i lies in the range $0 \leq P_i \leq 1$. It is further assumed that:

$$Z_i = AO + Alx_i \qquad \text{(B.2)}$$

Equations B.1 and B.2 indicate that probability of event Z occurring is dependent on the value of a single explanatory variable x which may take i=1,..., n values. It is assumed that these values are fixed for purpose of experimentation.

By substituting B.2 and completing some algebraic transformations, B.1 can be rewrittten as the following linear estimating equation:

$$\ln(P_i/(1-P_i) = AO+AlX_i + e_i \qquad \text{(B.3)}$$

Equation B.3 is known as the linear logistic model and is convenient for estimation purposes. Recall the P is limited to the range $0 \leq P \leq 1$. Unfortunately, most regression models do not lend themselves to dealing with bounded dependent variables. Therefore P is monotonically transformed such that the new dependent varible is $\ln(P/1-P)$. The left hand side of B.3 is alternately called the log odds of success, or more simply the "logit." The logit is a random variable with a range between - and + . It measures the <u>odds</u> than an event will occur.

Application of the above logit model to valuation problem is fairly straightforward. Of primary importance is the vector of hypothetical offers $x=(x_1,\ldots,x_N)$ which are proposed to respondents as well as a corresponding vector of the number of persons $r_i = (r_1,\ldots, r_N)$ who accept (rather than reject) each of the different offers. For example, r is the number of people who were confronted with an offer of x <u>and</u> accepted it. If the number of respondents receiving each hypothetical offer is $w_i = (w_1,\ldots,w_N)$, then the relative frequency of persons accepting offers x is given by the $r_i/w_i = (r_1/w_1,\ldots, r_N/w_N)$. Now let $P_i = (P_1,\ldots, P_N) = r_i/w_i$, where P_i (i= 1, ..., n) is interpreted as the probability (based on the sample relative frequency distribution) that a randonly selected individual will accept an offer of x_i.

If the assumption about a constant variance in the error term is fulfilled, it is possible to estimate the parameters in (B.3)

using ordinary least squares. Unfortunately, however, this assumption is often violated in the analysis of recreational data. The asymptotic variance of e_i can be written as:

$$V(e_i) = 1/w_i\left[(r_i/w_i)(1- r_i/w_i)\right] \qquad (B.4)$$

The problem is that for more generous offers the relative frequence of acceptance (r_i/w_i) is generally high. the opposite holds true for smaller offers. If this is the case, the variance of the logic is associated with high and low offers will tend to be different compared with the variance associated with medium sized offers.

It suffices to say here that if such heteroskedasticity is present it is necessary to use either weighted least squares or maximum liklihood estimation techniques. In the case of a single explanatory variable, x, weighted least squares is practical. When additional explanatory variables are included, maximum liklihood estimation seems to be the better alternative.

Once reliable estimates for A0 and A1 are obtained, it is possible to estimate the overall social value of the recreational resource as measured by consumer surplus. The first step in this procedure is to rewrite equation B.1 in terms of A0, A1

$$P(x)=1/1 + \exp(-(A0+A1x)) \qquad (B.5)$$

Equation B.5 has the characteristic that:

$$E(x) = \int P(x)dx. \qquad (B.6)$$

E(x) is the expected maximum willingness to pay of a randomly selected individual from the population. It is important to point out that the integral B.6 may be unbounded and $E(x) = \infty$. In the unbounded case, an arbitrarily large number (the highest offer, for instance) can be used as the upper limit in the integration.

If E(x) is the expected willingness to pay for a charter fishing license per trip, and if there are T total trips taken annually in the population, then it follows that E(x)*T is an estimate of the consumer surplus associated with charter fishing.